WIS Report 35
June 1996

US Army Corps of Engineers
Waterways Experiment Station

Wave Information Studies of US Coastlines

Wave Information Study Annual Summary Report, Gulf of Mexico 1994

by Barbara A. Tracy, Alan Cialone

Prepared for Headquarters, U.S. Army Corps of Engineers

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Waterways Experiment Station
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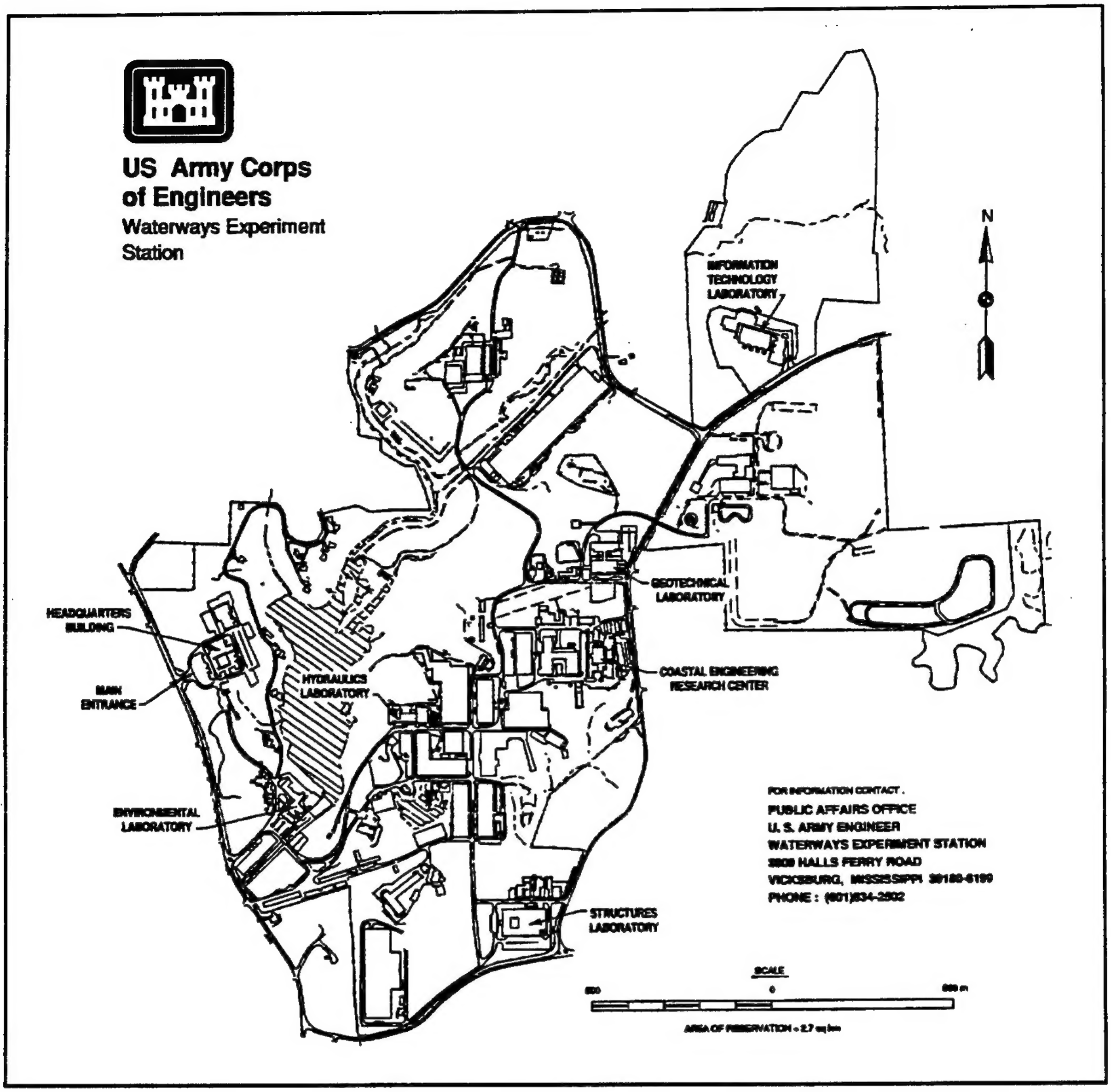

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Preface

In late 1976 a study to produce a wave climate for U.S. coastal waters was initiated at the U.S. Army Engineer Waterways Experiment Station (WES). The Wave Information Studies (WIS) was authorized by Headquarters, U.S. Army Corps of Engineers (HQUSACE) as part of the Coastal Field Data Collection Program, which is managed by the WES Coastal Engineering Research Center (CERC). Messrs. John H. Lockhart, Jr.; Charles B. Chesnutt; and Barry W. Holliday, HQUSACE, are Program Monitors for the Coastal Field Data Collection Program; Ms. Carolyn M. Holmes, CERC, is Program Manager; and Dr. Jon M. Hubertz, CERC, is WIS Project Manager.

This report, the 35th in a series, is a description of the Gulf of Mexico nowcast procedure and the 1994 Gulf of Mexico wave climatology. Wind products for the 1994 hindcast were obtained from the University Center for Atmospheric Research (UCAR) which archives the National Meteorological Center data. The authors appreciate Ms. Ilana Stern, UCAR, for assisting with data transfer. Ms. Barbara Tracy, CERC, served as principal investigator for the Gulf of Mexico nowcast. Mr. Alan Cialone, CERC, produced data analysis and comparison results. Dr. Hubertz provided technical assistance. This report was prepared by Ms. Tracy and Mr. Cialone.

The study was conducted under the direct supervision of Dr. Martin C. Miller, Chief, Coastal Oceanography Branch, and Mr. H. Lee Butler, Chief, Research Division, CERC; and under the general supervision of Dr. James R. Houston and Mr. Charles C. Calhoun, Jr., Director and Assistant Director, CERC, respectively.

At the time of publication of this report, Dr. Robert W. Whalin was Director of WES. COL Bruce K. Howard, EN, was Commander.

1 Introduction

Objective

This report discusses the Wave Information Studies (WIS) 1994 Gulf of Mexico (GOM) wave hindcast for U.S. GOM nearshore coastal stations. Previous WIS GOM nearshore coastal wave information for 1956-1975 is documented in WIS Report 18 (Hubertz and Brooks 1989). Wave information for GOM hurricane events during 1956-1975 is available at the same nearshore stations (Abel et al. 1989). Updated GOM wave information for 1976-1993 will be available in the near future. WIS has instituted a "nowcast" system to make U.S. coastal wave information available from 1994 to the present. The WIS nowcast adds yearly updates to the original database and meets the needs of coastal engineers who need recent wave information. The nowcast wave hindcasts use monthly wind information from the National Meteorological Center (NMC) to drive the WIS wave hindcast numerical model. Measured wave buoy data, available several months after being recorded, are used to verify the numerical hindcasts. When the completed hindcast has been verified with measured data, the nowcast information is transferred to the Coastal Engineering Data Retrieval System (CEDRS) (McAneny 1995) on the World Wide Web computer network. The first nowcast, 1994, was produced for the Atlantic Ocean and is discussed in WIS Report 34 (Tracy and Cialone 1995). This 1994 GOM nowcast report with a format similar to WIS Report 34 provides a description and analysis of the 1994 GOM wave climatology and is the first in a series of annual GOM nowcast reports.

Approach

NMC global winds were used to produce the wind fields for the wave hindcasts. These winds consist of *u,v* wind speed components every 6 hr at an elevation of 10 m on a global grid with a spacing of 0.9375 deg latitude and longitude. The September 1989 issue of *Weather and Forecasting* is devoted to papers on the NMC modeling system. An overview of the system is provided by Bonner (1989). Recent changes to the NMC global system are documented in Kanamitsu et al. (1991). Previous wind fields for the 1956-1975 hindcast were produced from a numerical analysis of the pressure fields

(Corson, Resio, and Vincent 1980; Resio, Vincent, and Corson 1982) using computer programs developed within WIS.

The GOM latitude-longitude grid (shown in Figure 1) has a spacing of 0.25 deg latitude and longitude. The previous GOM hindcast for 1956-1975 (Hubertz and Brooks 1989) used a latitude-longitude grid with a spacing of 0.5 deg. The current grid was enlarged from the previous grid to include an area for wave development east of the stations in the Key West area. The NMC global *u,v* wind components were interpolated to the grid intersections in Figure 1. The few missing 6-hr wind fields were interpolated from the available 6-hr information on either side of the missing hour.

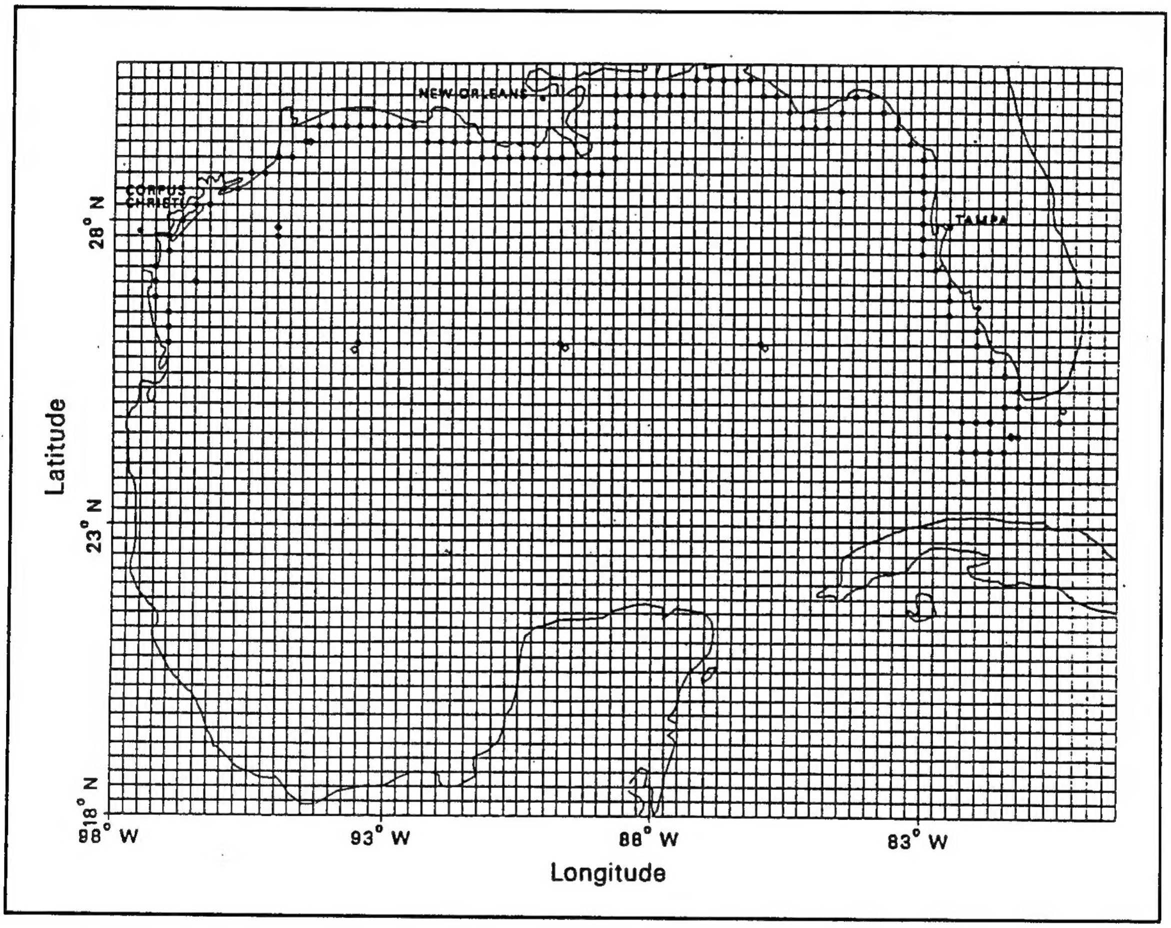

Figure 1. Gulf of Mexico grid extends from latitude 18° to 30.5° N (51 rows) and from longitude 98° to 79.5° W (75 columns)

The latest version of the WIS wave hindcast model, WISWAVE 2.1, described in WIS Report 27 (Hubertz 1992), was used to produce the 1994 GOM wave hindcast. This is the same version of the model that produced the 1994 Atlantic wave nowcast described in WIS Report 34 (Tracy and

Cialone 1995). Data were saved at the output locations shown in Figure 2. The finer spacing of the new hindcast grid allows a better definition of the land-water boundary and more closely spaced output locations than the previous hindcast. Table 1 lists the output station number, grid column and row, latitude, longitude, and depth of each station. These 1994 data are available from the CEDRS database and are in the same form as all the recent WIS output station data. McAneny (1995) gives a description of the CEDRS data. The CEDRS data and a data description are now available on the Internet (see page 51). Wave parameters including significant wave height, peak wave period, mean wave period, wave direction, wind speed, and wind direction are available at 1-hr intervals for the entire year at each station in Figure 2.

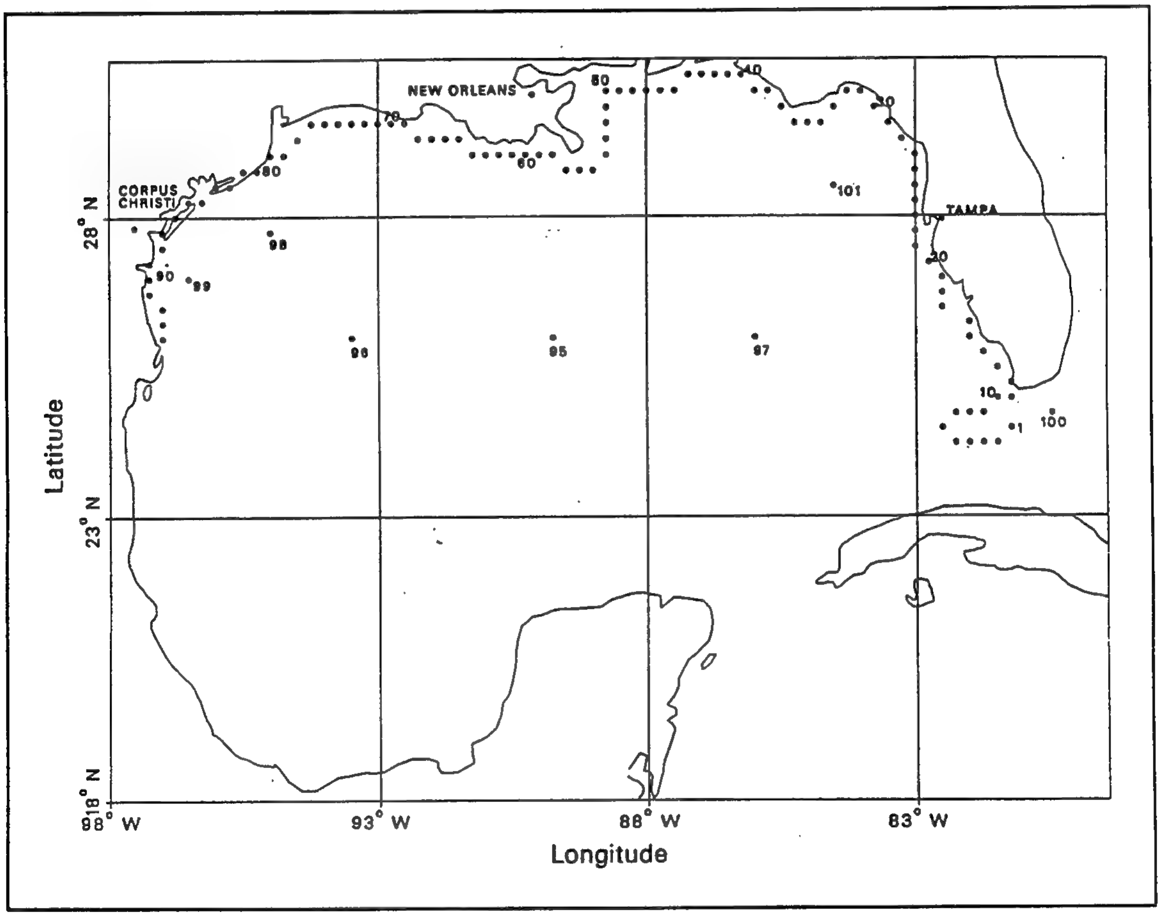

Figure 2. Location of stations where Gulf of Mexico data are saved

Table 1
Gulf of Mexico Output Stations

Station	I (column)	J (row)	Latitude	Longitude	Depth (m)
1	68	27	24.50	81.25	102
2	67	26	24.25	81.50	451
3	66	26	24.25	81.75	450
4	65	26	24.25	82.00	496
5	64	26	24.25	82.25	475
6	63	27	24.50	82.50	14
7	64	28	24.75	82.25	22
8	65	28	24.75	82.00	16
9	66	28	24.75	81.75	9
10	67	29	25.00	81.50	8
11	68	29	25.00	81.25	4
12	68	30	25.25	81.25	3
13	67	31	25.50	81.50	6
14	66	32	25.75	81.75	7
15	65	33	26.00	82.00	12
16	65	34	26.25	82.00	12
17	63	35	26.50	82.50	18
18	63	36	26.75	82.50	16
19	63	37	27.00	82.50	10
20	62	38	27.25	82.75	12
21	61	39	27.50	83.00	17
22	61	40	27.75	83.00	11
23	61	41	28.00	83.00	11
24	61	42	28.25	83.00	8
25	61	43	28.50	83.00	10
26	61	44	28.75	83.00	5
27	61	45	29.00	83.00	5
28	60	46	29.25	83.25	4
29	59	47	29.50	83.50	4
30	58	48	29.75	83.75	5
31	57	49	30.00	84.00	3
32	56	49	30.00	84.25	4
33	55	48	29.75	84.50	11
34	54	47	29.50	84.75	19
35	53	47	29.50	85.00	7
36	52	47	29.50	85.25	19

(Sheet 1 of 3)

Table 1 (Continued)

Station	I (column)	J (row)	Latitude	Longitude	Depth (m)
37	51	48	29.75	85.50	19
38	50	49	30.00	85.75	19
39	49	49	30.00	86.00	31
40	48	50	30.25	86.25	28
41	47	50	30.25	86.50	16
42	46	50	30.25	86.75	14
43	45	50	30.25	87.00	11
44	44	50	30.25	87.25	5
45	43	49	30.00	87.50	28
46	42	49	30.00	87.75	28
47	41	49	30.00	88.00	28
48	40	49	30.00	88.25	29
49	39	49	30.00	88.50	25
50	38	49	30.00	88.75	14
51	38	48	29.75	88.75	14
52	38	47	29.50	88.75	18
53	38	46	29.25	88.75	61
54	38	45	29.00	88.75	209
55	37	44	28.75	89.00	574
56	36	44	28.75	89.25	205
57	35	44	28.75	89.50	101
58	34	45	29.00	89.75	37
59	33	45	29.00	90.00	25
60	32	45	29.00	90.25	13
61	31	45	29.00	90.50	10
62	30	45	29.00	90.75	7
63	29	45	29.00	91.00	6
64	28	45	29.00	91.25	4
65	27	46	29.25	91.50	4
66	26	46	29.25	91.75	7
67	25	46	29.25	92.00	7
68	24	46	29.25	92.25	5
69	23	47	29.50	92.50	9
70	22	47	29.50	92.75	13
71	21	47	29.50	93.00	12
72	20	47	29.50	93.25	13
73	19	47	29.50	93.50	9

(Sheet 2 of 3)

Table 1 (Concluded)

Station	I (column)	J (row)	Latitude	Longitude	Depth (m)
74	18	47	29.50	93.75	10
75	17	47	29.50	94.00	12
76	16	47	29.50	94.25	11
77	15	46	29.25	94.50	15
78	14	45	29.00	94.75	18
79	13	45	29.00	95.00	15
80	12	44	28.75	95.25	20
81	11	44	28.75	95.50	14
82	10	43	28.50	95.75	20
83	9	43	28.50	96.00	15
84	8	42	28.25	96.25	22
85	7	42	28.25	96.50	9
86	6	41	28.00	96.75	16
87	5	40	27.75	97.00	18
88	5	39	27.50	97.00	27
89	4	38	27.25	97.25	20
90	4	37	27.00	97.25	24
91	4	36	26.75	97.25	18
92	5	35	26.50	97.00	35
93	5	34	26.25	97.00	27
94	5	33	26.00	97.00	27
95	34	33	26.00	89.75	3062
96	19	33	26.00	93.50	3125
97	49	33	26.00	86.00	3210
98	13	40	27.75	95.00	458
99	7	37	27.00	96.50	142
100	71	28	24.75	80.50	183
101	55	43	28.50	84.50	50

(Sheet 3 of 3)

2 Weather Events Description

The 1994 hurricane season produced one hurricane and one tropical storm that affected the U.S. GOM coastal stations. Tropical Storm Alberto moved from the western tip of Cuba into the GOM at the end of June and made landfall at the Florida panhandle on the morning of July 3, with a central pressure of 993 mb. Figure 3 shows Alberto's track as a solid line. Gordon traveled through the eastern GOM from November 8 to November 16. Although Gordon reached hurricane status, it was classified as a tropical storm in the Gulf. Figure 3 shows Gordon's track with a dashed line. Gordon first moved over the Florida Keys from the Caribbean area into the Gulf of Mexico. The storm next moved over the west coast of Florida with a central pressure of 996 mb and then moved into the Atlantic after crossing Florida.

The nowcasting procedure provides the opportunity to check the model output data at all the measurement devices each month. Figure 4 shows the GOM buoy locations. Preliminary hindcasts using only the NMC winds showed underprediction in comparison with the measured data in the eastern GOM for both Alberto and Gordon. A better storm wind field representation was needed so the data in the preliminary report (Pasch 1995) from the National Hurricane Center (NHC) were used in the HURWIN process described in WIS Report 33 (Brooks and Brandon 1995) to create a hurricane wind field for Gordon. Hurricane storm parameter information available via the computer network from NHC was used to prepare the Alberto wind fields. These hurricane winds were calculated at 1-hr intervals and were written to the 0.25-deg GOM grid locations. These new hurricane wind fields were then blended into the original NMC GOM wind fields to produce a better definition of tropical storms Alberto and Gordon. Figure 5 compares the model output, using the redefined Alberto wind field, to measured data from buoy 42036 for the month of July. Alberto moved over this location during the first week of July and produced a maximum significant wave height of 4 m. Figure 6 compares data for the month of November at a station in the Florida Keys close to Gordon's path. Gordon moved near this location (buoy 42037) on November 15 and produced the wind speed and significant wave height peak shown in Figure 5. This comparison location (near the Florida Keys) was not only affected as the storm passed over, but it was also affected by swell moving in from the northwest as the storm made its way up the west coast of Florida.

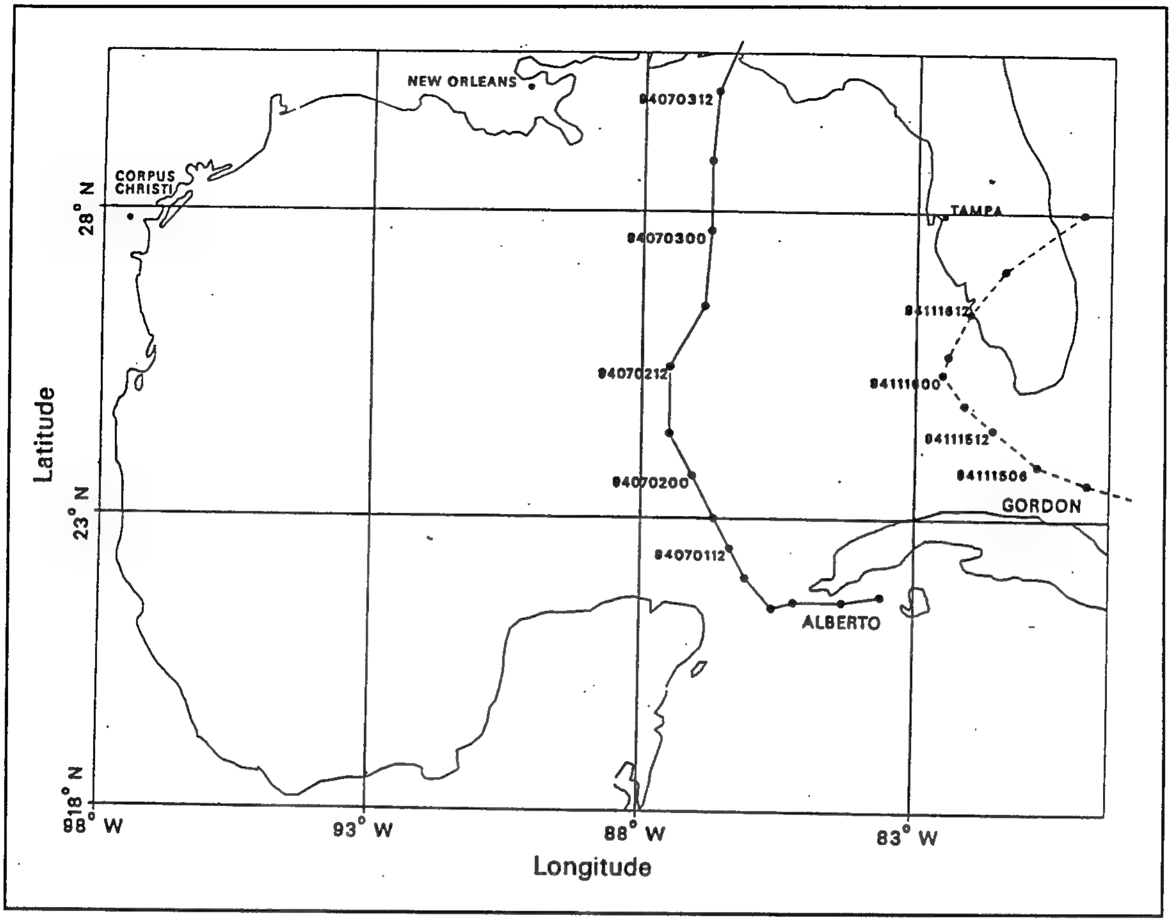

Figure 3. Tracks of Tropical Storm Alberto (solid line) and Hurricane Gordon (dashed line)

The WIS significant wave height for Gordon at this location is slightly high because all the shallow-water processes cannot be included and the Florida Keys cannot be resolved sufficiently at this grid spacing. Chapter 3 contains a discussion of the statistics for these monthly plots and the other verification locations.

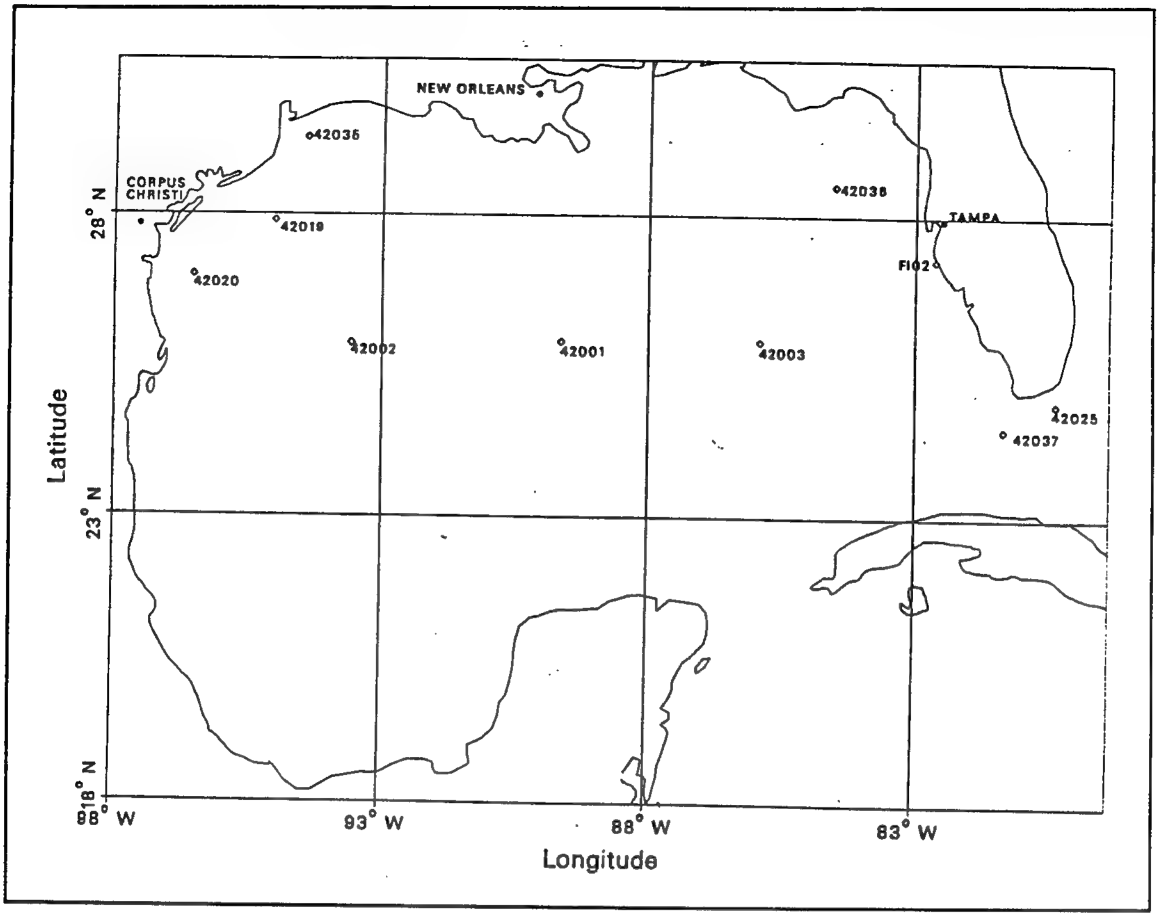

Figure 4. Location of buoys in Gulf of Mexico

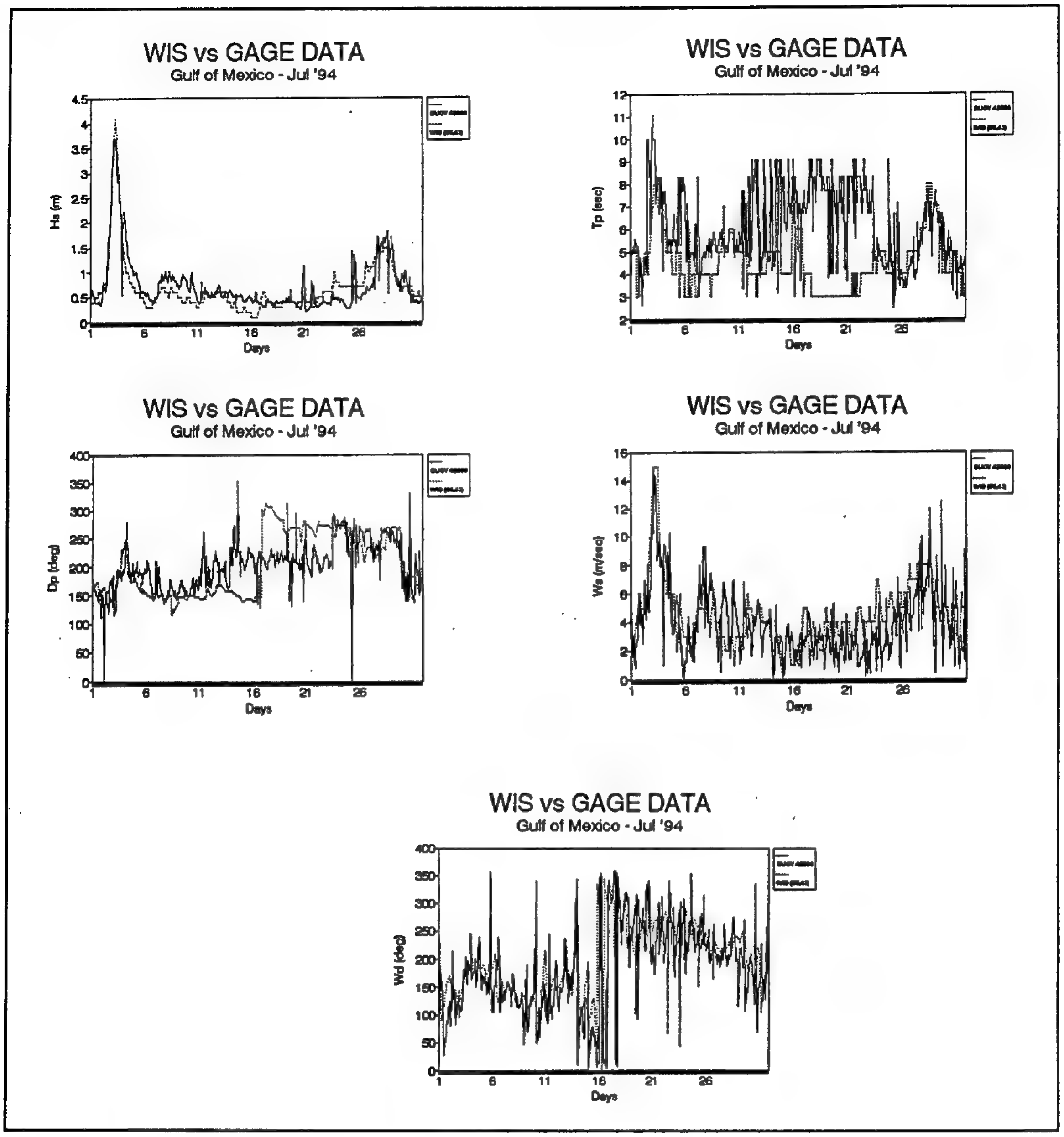

Figure 5. Tropical Storm Alberto wave comparison. Buoy 42036 is located off the Florida coast at latitude 28.5 °N, longitude 84.5 °W

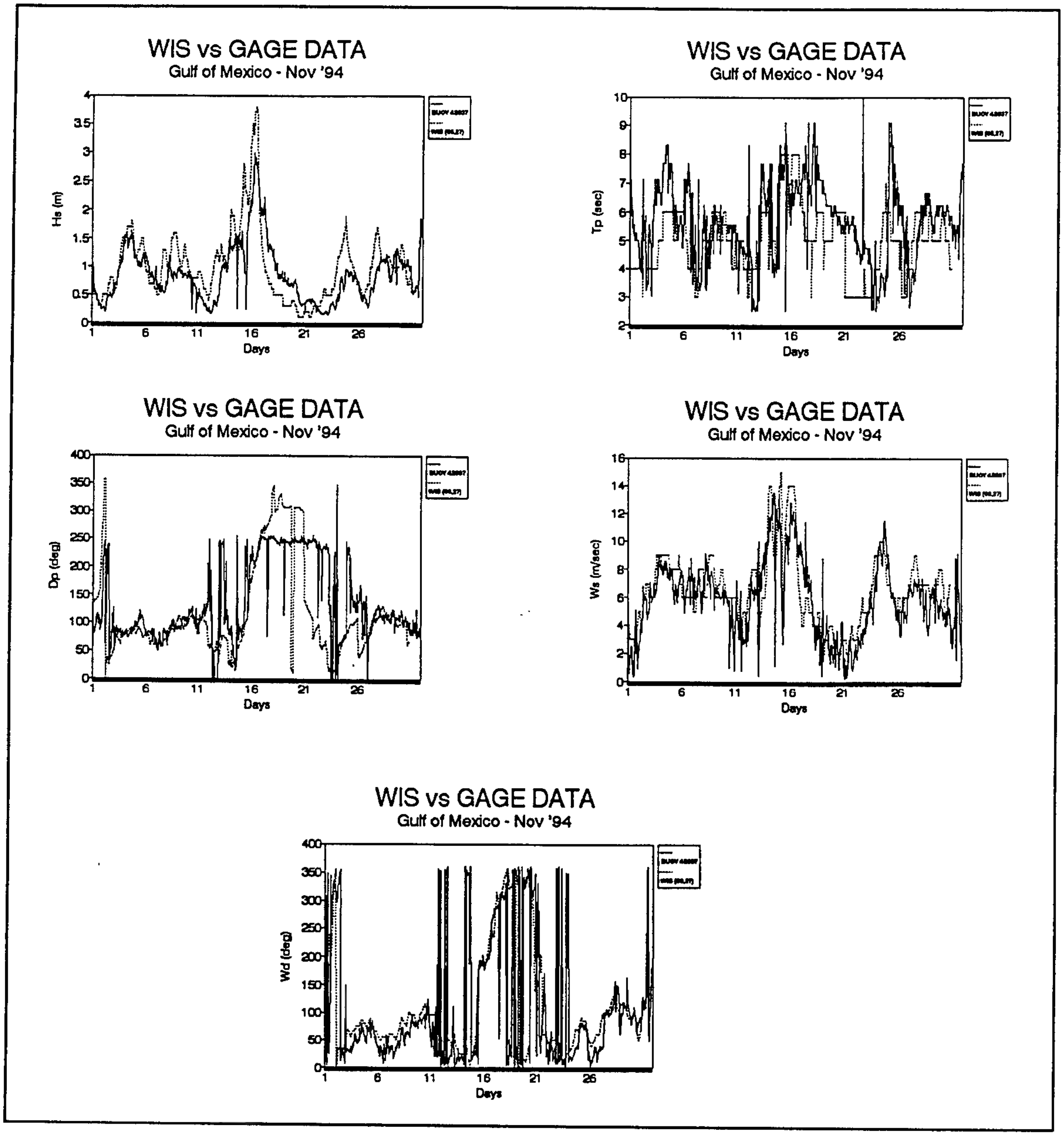

Figure 6. Hurricane Gordon comparison at NOAA buoy 42037

3 Verification of Model Results

Wind and wave data from nine National Oceanic and Atmospheric Administration (NOAA) wave gauges and one Network for Engineering Monitoring of the Ocean wave gauge (FL02 at Sarasota, FL) shown in Figure 4 were used for comparisons with the closest WIS stations. Table 2 lists the location and depth of each buoy and the corresponding WIS station number. Comparisons were done each month and included 7 to 10 buoys each month, depending on data availability. Figure 7 shows a representative comparison plot for NOAA buoy 42036 and the corresponding WIS station for March 1994. Buoy 42036 is located northwest of Tampa, FL. This figure contains separate plots for significant wave height (*Hs*), peak period (*Tp*), peak mean wave direction (*Dp*), wind speed (*Ws*), and a wind direction (*Wd*) comparison.

Table 2
Buoy Locations

Buoy	WIS Station	Latitude	Longitude	Depth (m)
42025	100	24.95	80.44	52
42037	1	24.51	81.38	101
FL02	20	27.30	82.59	7
42036	101	28.50	84.50	51
42003	97	25.94	85.91	3164
42001	95	25.93	89.65	3246
42002	96	25.89	93.57	3200
42035	77	29.25	94.41	15
42019	98	27.90	95.00	120
42020	99	27.01	96.51	131

Statistics describing the monthly means taken from the monthly plots are shown in Tables 3 through 14. The bias, the root mean square difference, and the number of cases used for comparison are listed in these tables. Root mean

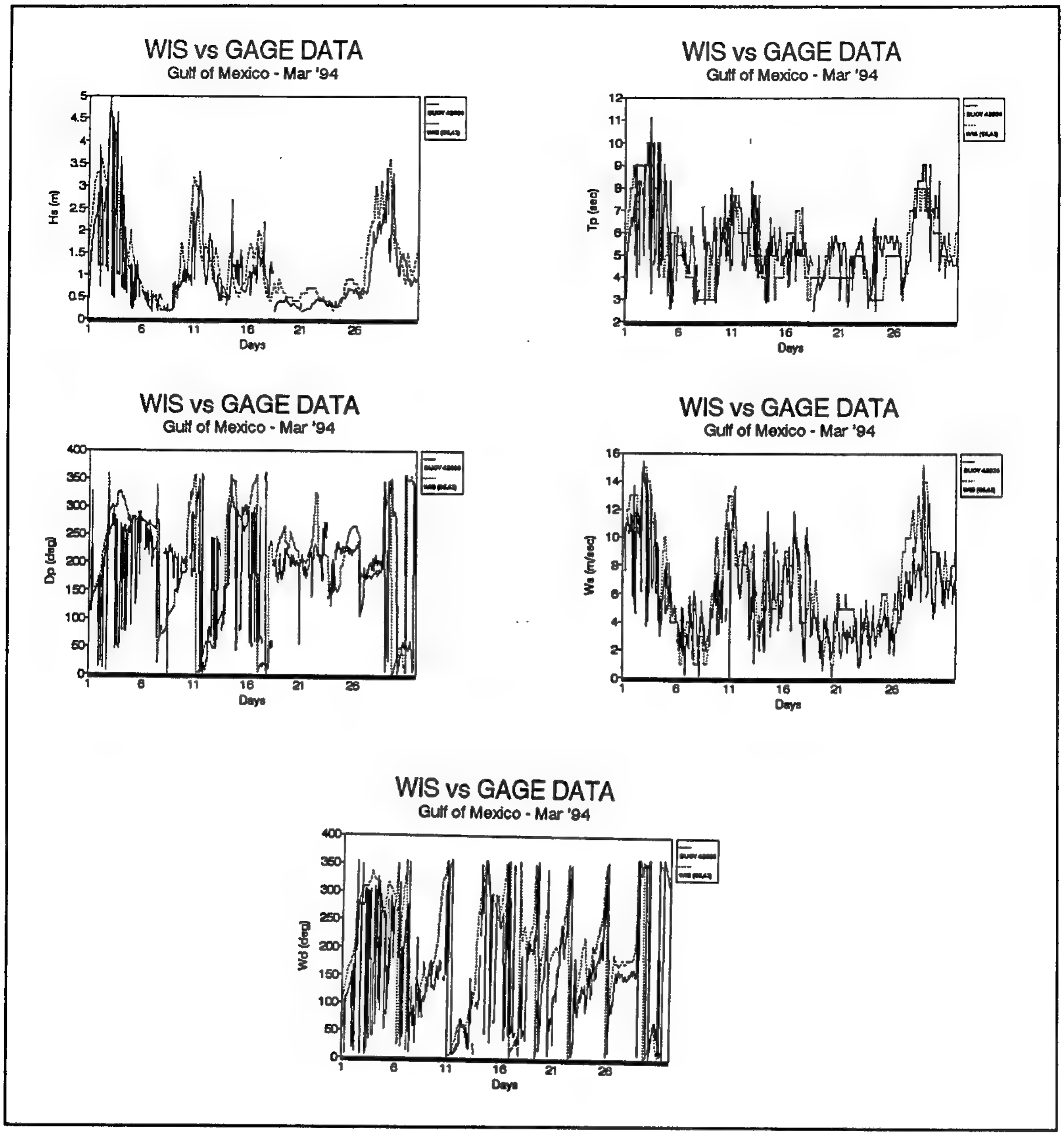

Figure 7. Example comparison plot for March

square differences between the hindcast and the measured data were calculated by summing the square of the difference between the two for each time period, then taking the square root of the total and dividing it by the number of records used. The bias for each month was calculated by subtracting the monthly buoy mean from the monthly WIS mean. A positive bias indicates the WIS value is higher than the measured value. Monthly statistics describing the plots shown in Figure 7 are listed in the second row of the March statistics table (Table 5). The wave height bias is +0.2 m, and the peak period bias is -0.3 sec. The wave height and peak period bias indicate very good agreement

Table 3
Gulf of Mexico, January

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42036	101	.2	.7	716	-.2	1.5	716	-6.5	64.3	710	.4	2.7	716	22.1	51.2	699
FL02	20	.4	.5	672	-.9	1.9	413	-5.8	99.4	411	.0	0.0	0	0.0	0.0	0
44002	96	.1	.6	740	-.2	1.1	740	0.0	0.0	0	-.4	2.1	740	7.0	32.1	724
42035	77	.1	.5	739	-.2	1.3	725	0.0	0.0	0	-.8	2.6	739	14.6	43.1	723
42001	95	.1	.5	740	-.3	1.1	740	0.0	0.0	0	.1	2.3	740	9.4	38.9	732
42003	97	.0	.6	739	-.4	1.3	739	.0	.0	0	-.8	2.6	738	5.0	29.2	725
42019	98	.2	.7	281	-.2	1.4	281	.0	.0	0	.9	2.3	278	-6.2	29.6	273
42020	99	.0	.5	739	-.4	1.3	739	.0	.0	0	.1	2.1	739	3.1	35.0	705

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 4
Gulf of Mexico, February

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42036	101	.2	.5	554	-.1	1.3	554	-2.5	41.2	532	.3	2.0	553	14.2	33.4	540
FL02	20	.3	.4	655	-1.3	2.0	321	82.1	103.2	299	.0	.0	0	.0	.0	0
42035	77	.1	.3	653	-.2	1.3	653	.0	.0	0	-.2	2.0	652	15.7	45.7	643
42001	95	.1	.4	654	-.3	1.0	654	.0	.0	0	-.3	1.8	654	6.4	36.1	651
42002	96	.1	.4	657	-.1	1.1	657	.0	.0	0	-.6	2.0	657	8.1	31.5	652
42003	97	.1	.4	649	-.5	1.3	649	.0	.0	0	-.1	2.0	649	-6.8	37.3	648
42019	98	.1	.3	652	-.1	1.3	652	.0	.0	0	.8	2.1	646	3.2	32.1	628
42020	99	.0	.4	651	-.5	1.4	651	.0	.0	0	.4	2.3	650	-.7	33.5	636
42025	100	.2	.4	596	-.3	1.3	596	.0	.0	0	.0	.0	0	.0	.0	0

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 5
Gulf of Mexico, March

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.0	.3	92	-1.6	2.2	92	19.0	76.8	91	.9	1.7	92	20.7	41.1	91
42036	101	.2	.5	575	-.3	1.2	575	10.5	44.4	561	.9	2.1	582	27.3	53.1	571
FL02	20	.3	.4	727	-1.0	2.1	453	95.3	106.6	451	.0	.0	0	.0	.0	0
42035	77	.0	.3	738	-.3	1.2	738	.0	.0	0	-.7	2.1	740	20.0	49.8	729
42001	95	.2	.5	730	-.1	1.0	730	.0	.0	0	.3	2.3	729	14.1	46.2	727
42002	96	.1	.5	735	-.3	1.1	735	.0	.0	0	-.5	2.5	735	9.6	40.1	722
42003	97	.1	.4	739	-.6	1.2	739	.0	.0	0	-.1	1.7	738	5.5	44.0	733
42019	98	.0	.4	740	-.1	.9	740	.0	.0	0	.1	1.9	739	12.5	38.8	730
42020	99	.0	.4	743	-.4	1.3	743	.0	.0	0	.2	2.1	742	2.6	38.0	737
42025	100	.2	.3	548	-.7	1.7	548	.0	.0	0	.0	.0	0	.0	.0	0

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 6
Gulf of Mexico, April

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.3	.4	706	-.7	1.8	706	-4.3	41.9	689	1.4	2.2	710	11.8	44.5	706
42036	101	.0	.3	683	-.4	1.1	682	-16.2	46.4	670	.5	2.0	703	27.4	58.5	687
FL02	20	.2	.3	380	-1.5	2.0	153	82.6	96.4	152	.0	.0	0	0.0	.0	0
42035	77	.1	.3	718	.1	1.0	718	.0	.0	0	-1.0	2.2	717	16.9	40.7	715
42001	95	.2	.4	717	-.3	1.0	717	.0	.0	0	.4	1.8	716	1.3	38.3	717
42002	96	.1	.4	718	-.4	.9	718	.0	.0	0	-.2	1.9	718	13.6	42.0	718
42003	97	.0	.3	719	-1.2	1.9	718	.0	.0	0	-.2	1.7	716	5.3	33.8	711
42019	98	.1	.4	720	.1	.9	720	.0	.0	0	.0	2.3	719	14.0	40.2	716
42020	99	.1	.5	367	-.1	1.0	367	.0	.0	0	.6	2.6	367	11.6	28.2	363
42025	100	.3	.4	629	-.3	1.1	628	.0	.0	0	.0	.0	0	.0	.0	0

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 7
Gulf of Mexico, May

Gauge	Station	Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
		Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.1	.2	623	-1.2	1.8	624	12.1	56.0	584	.7	1.7	720	4.4	57.5	709
42036	101	.2	.3	671	-.2	.9	671	-4.2	61.2	636	1.0	2.1	720	19.3	66.8	712
FL02	20	.2	.3	185	-.7	1.0	38	58.2	74.6	38	.0	.0	0	.0	.0	0
42035	77	-.1	.2	731	-.5	1.4	730	.0	.0	0	-1.3	2.6	730	7.4	36.6	724
42001	95	.1	.2	731	-.5	1.1	731	.0	.0	0	-.1	1.6	724	-.6	35.1	720
42002	96	.1	.2	735	-.3	.8	735	.0	.0	0	-.6	1.8	735	5.6	30.4	735
42003	97	.0	.2	726	-1.0	1.8	726	.0	.0	0	-.3	1.5	733	2.5	44.8	732
42019	98	-.1	.2	729	-.4	1.0	729	.0	.0	0	.1	1.9	730	-1.5	36.0	730
42020	99	-.1	.3	737	-.5	1.0	737	.0	.0	0	-.1	2.2	737	-7.2	36.6	737

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 8
Gulf of Mexico, June

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.2	.3	644	-.7	1.3	644	6.7	38.6	633	1.0	1.8	690	6.1	48.0	688
42036	101	.0	.2	710	-1.3	2.1	710	12.8	56.0	698	.9	2.1	708	25.8	65.9	707
FL02	20	.1	.1	217	-1.1	1.7	89	136.7	140.6	89	.0	.0	0	.0	.0	0
42035	77	.0	.2	718	-.3	1.1	712	.0	.0	0	-1.0	2.4	716	5.7	44.9	715
42001	95	.1	.2	712	-.4	1.0	712	.0	.0	0	-.5	1.6	706	-4.7	34.6	706
42002	96	.0	.2	716	-.6	1.1	716	.0	.0	0	-.8	2.0	716	-1.5	42.0	714
42003	97	-.2	.4	713	-2.3	2.8	713	.0	.0	0	-1.4	2.7	10	-2.8	19.3	10
42019	98	-.1	.3	705	-.6	1.2	705	.0	.0	0	.4	2.1	621	2.0	69.6	621
42020	99	.0	.3	718	-.5	1.0	718	.0	.0	0	-.1	2.2	718	-4.8	38.0	718

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 9
Gulf of Mexico, July

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.2	.3	706	-.5	1.0	706	4.7	22.3	703	1.2	1.9	706	5.2	25.6	706
42036	101	.0	.2	716	-1.6	2.6	716	-1.2	46.5	713	.6	2.0	714	9.5	48.6	714
FL02	20	.1	.1	163	-.4	1.0	67	16.7	47.8	67	.0	.0	0	.0	0.	0
42035	77	-.1	.2	726	-.3	.9	725	.0	.0	0	-1.1	2.5	725	-8.7	37.6	724
42001	95	.1	.3	720	-.2	1.1	718	.0	.0	0	-.1	1.6	712	-14.5	46.9	710
42002	96	.1	.2	730	-.1	1.0	729	.0	.0	0	-.5	1.7	730	-10.8	40.5	730
42003	97	-.1	.2	721	-2.2	2.8	721	.0	.0	0	-.4	1.9	120	-1.2	50.6	120
42019	98	-.1	.2	661	-.2	.8	661	.0	.0	0	-.9	2.2	81	-.2	39.0	81
42020	99	.0	.3	726	-.3	.9	726	.0	.0	0	-.3	2.1	726	-11.4	29.4	726

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 10
Gulf of Mexico, August

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.2	.3	734	-.7	1.4	734	5.0	28.0	727	1.5	2.1	733	3.6	36.9	734
42036	101	-.1	.3	718	-.7	1.5	718	-7.0	43.0	702	.2	1.7	729	20.2	53.3	728
FL02	20	.1	.2	279	-1.6	2.3	136	19.4	40.8	136	.0	.0	0	.0	.0	0
42035	77	.0	.2	741	-.5	1.2	734	.0	.0	0	-1.0	2.1	719	10.5	57.3	719
42001	95	.2	.2	725	-.6	1.3	724	.0	.0	0	.1	1.8	731	-1.5	49.9	729
42002	96	.1	.2	738	-.6	1.3	738	.0	.0	0	-.2	1.9	738	-5.0	41.3	736
42003	97	.0	.2	716	-1.2	1.9	716	.0	.0	0	-.2	1.9	716	.6	52.8	724
42019	98	-.1	.3	140	-.6	.8	140	.0	.0	0	-.5	2.1	276	10.3	47.6	274
42020	99	.0	.3	738	-.5	.9	738	.0	.0	0	-.1	2.2	737	-4.4	39.2	736

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 11
Gulf of Mexico, September

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.2	.3	667	-.5	1.1	667	12.3	33.0	654	1.1	2.0	700	9.0	47.8	698
42036	101	.0	.3	699	-.7	1.6	699	-3.8	51.7	696	.1	1.6	699	10.3	44.6	697
FL02	20	.1	.2	355	-1.9	2.5	213	-42.5	68.8	213	.0	.0	0	.0	.0	0
42002	96	.0	.2	697	-.6	1.3	697	-11.3	39.9	670	-.2	1.8	696	-3.6	45.5	681
42035	77	-.1	.3	701	-.6	1.3	695	.0	.0	0	-1.4	2.5	697	-.6	50.3	688
42001	95	.1	.3	708	-.5	1.3	708	.0	.0	0	-.3	1.9	708	4.5	52.2	695
42020	99	-.1	.3	708	-.6	1.1	708	.0	.0	0	.1	2.2	708	-7.9	52.7	701

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 12
Gulf of Mexico, October

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.1	.3	715	-1.3	2.1	715	-24.6	60.6	683	.8	1.6	719	6.3	50.2	718
42036	101	.1	.4	722	-.3	1.3	722	-7.2	44.7	715	.6	1.9	724	11.7	49.0	721
FL02	20	.2	.3	228	-1.0	1.8	154	-20.6	56.6	154	.0	0.0	0	.0	.0	0
42002	96	.0	.3	699	-.5	1.3	699	13.1	33.3	696	-.5	1.7	699	1.0	34.8	688
42035	77	-.1	.3	734	-.3	1.1	734	.0	.0	0	-1.3	2.3	736	7.0	41.1	715
42001	95	.1	.3	733	-.3	1.2	733	.0	.0	0	-.4	1.7	733	9.8	35.6	723
42020	99	.0	.3	736	-.6	1.5	736	.0	.0	0	-.1	1.8	736	-3.5	31.6	727

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 13
Gulf of Mexico, November

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.1	.4	711	-.7	1.5	709	-20.2	67.2	688	.6	1.8	711	9.6	39.5	706
42036	101	.2	.5	703	.0	1.2	703	-10.0	41.1	682	.9	2.1	713	4.4	40.6	698
FL02	20	.3	.5	218	-1.0	1.6	138	-54.0	93.0	138	.0	.0	0	.0	.0	0
42002	96	.1	.4	684	-.2	1.1	683	1.7	33.1	680	.3	1.7	684	-2.4	38.6	684
42035	77	-.1	.3	703	-.1	.9	703	.0	.0	0	-.9	2.2	703	12.4	27.4	693
42001	95	.2	.4	711	-.1	1.0	711	.0	.0	0	-.1	1.6	710	2.9	29.0	695
42019	98	.1	.4	315	.1	1.2	315	.0	.0	0	.3	1.6	315	3.8	26.2	314
42020	99	.0	.4	712	-.2	1.2	712	.0	.0	0	-.2	1.9	712	-2.6	35.2	699

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

Table 14
Gulf of Mexico, December

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.1	.3	742	-1.2	2.2	742	-2.4	63.5	701	.8	1.6	741	13.9	37.9	724
42036	101	.2	.5	724	.2	1.0	724	4.3	41.3	695	.6	1.9	731	7.4	39.0	700
FL02	20	.2	.3	280	-.6	1.6	190	-25.9	70.0	187	.0	.0	0	.0	.0	0
42002	96	.1	.3	699	-.2	.8	699	.0	.0	0	.1	1.9	698	6.4	37.7	681
42035	77	-.1	.3	729	-.4	1.0	722	.0	.0	0	-1.5	2.4	726	11.2	35.7	697
42001	95	.2	.3	740	.0	.8	740	.0	.0	0	.0	2.0	740	7.2	38.9	718
42019	98	.0	.3	382	-.1	.8	382	.0	.0	0	-.2	1.5	382	1.5	29.9	378
42020	99	-.1	.3	742	-.4	1.0	742	.0	.0	0	-.3	1.8	742	-3.6	31.8	708

Bias = model - gauge
Direction from, compass
Values every 1 hour, 744 possible

with the measured data. The wave direction shows a bias of 10.5 deg[1]. The *Dp* plot in Figure 7 shows generally good agreement on the wave direction. The wind speed (*Ws*) bias indicates good agreement with a bias of +0.9 m/sec. The wind direction (*Wd*) bias is 27.2 deg. The wind direction may show some variation, since it is an interpolated direction. The largest wave direction differences with the WIS data are shown by FL02 on the Florida coast south of Tampa. Since the WIS comparison point is farther offshore than FL02, WIS wave heights are consistently higher than the FL02 measurements; and local directional changes close to shore cannot be shown at the WIS station.

Figures 8 through 19 reduce the information from the monthly plots (similar to Figure 7) to a monthly bar chart comparison of the mean significant wave height and the mean peak period for each gauge-WIS station set. The WIS mean is shown as an empty bar, and the gauge mean is shown with cross-bar shading.

Figure 20 shows the bar charts relating the yearly mean significant wave heights and the yearly mean peak periods for each of the comparison locations. Table 15 lists the statistics related to these yearly means. Table 15 has the same format as Tables 3-14. The average wave height bias for the year is +0.11 m, and the average peak period bias for the year is -0.56 sec. Positive numbers indicate that the WIS parameter is higher than the gauge. These statistics indicate that the WIS wave heights run slightly high and the WIS peak periods are slightly low. These statistics show good agreement between the WIS hindcast wave heights and peak periods and the measured data. The yearly wave direction bias averages 5.8 deg. If only the NOAA buoys are included, the yearly average wave direction bias is -1.56 deg, indicating very close agreement of the WIS and buoy wave direction. The average yearly wind speed bias is +0.02 m/sec, and the average yearly wind direction bias is +4.3 deg. Wind speeds and directions are very close to the measured data.

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1 To convert degrees (angle) to radians, multiply times a factor of 0.01745329.

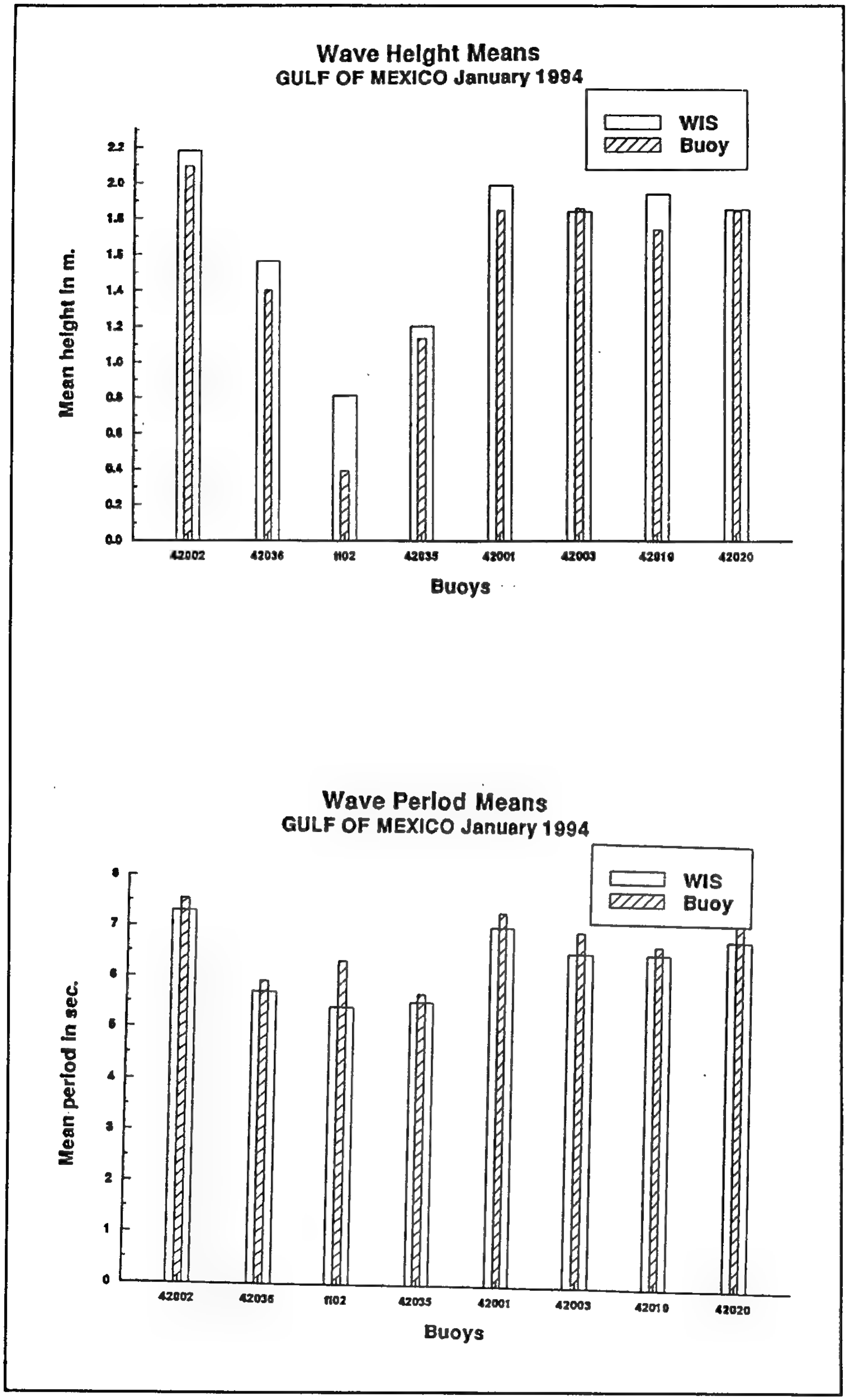

Figure 8. Wave height means and wave period means, January 1994

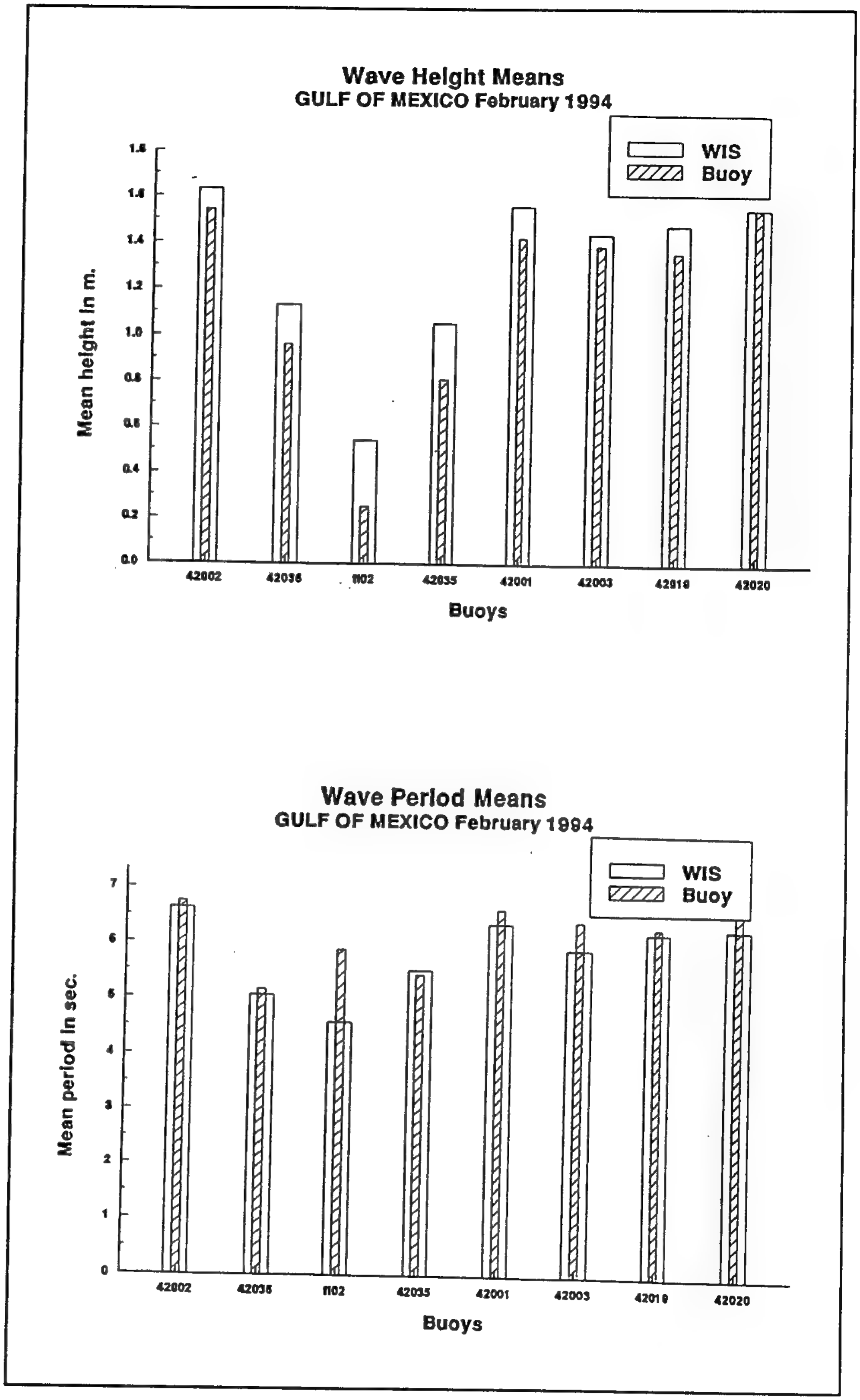

Figure 9. Wave height means and wave period means, February 1994

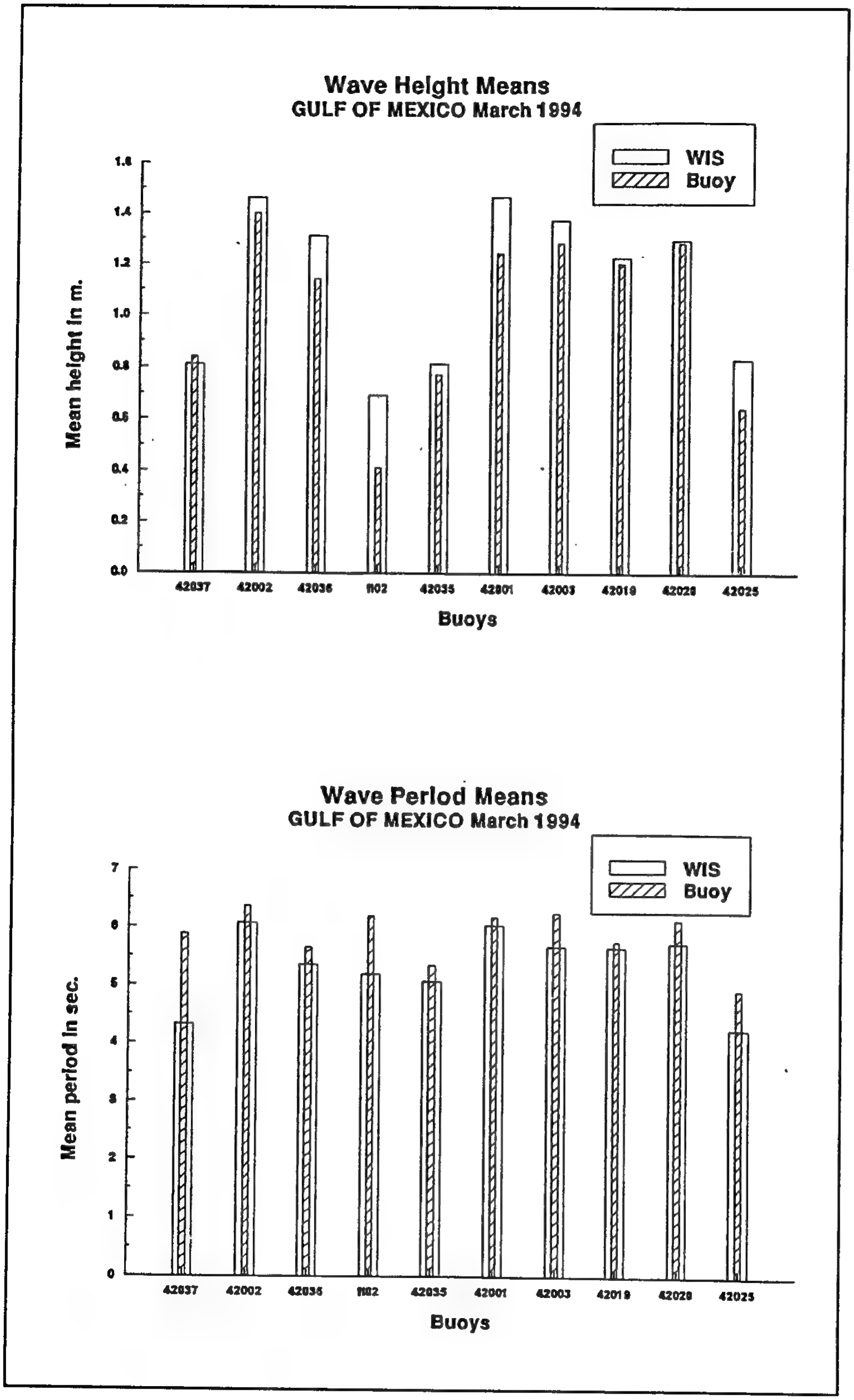

Figure 10. Wave height means and wave period means, March 1994

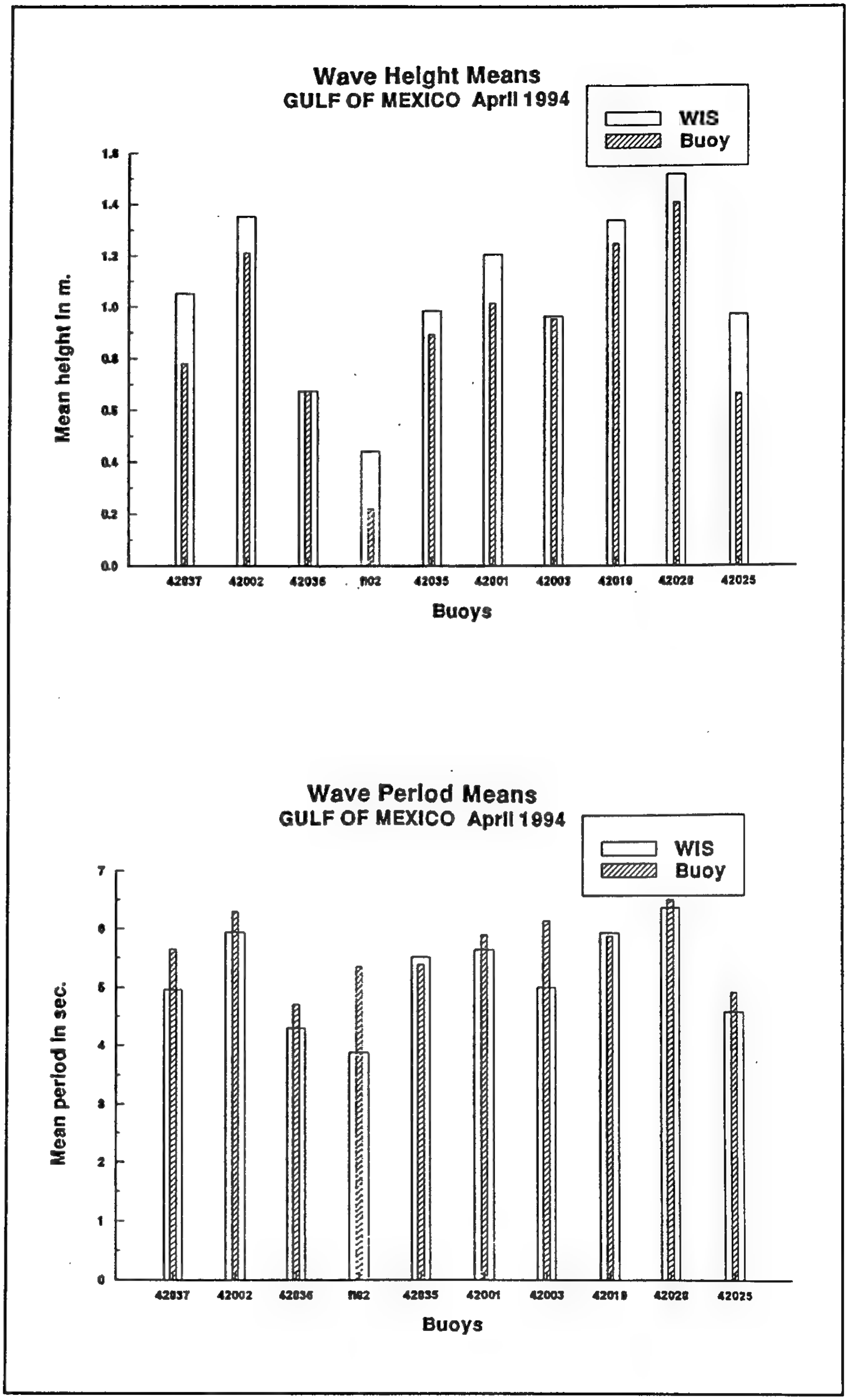

Figure 11. Wave height means and wave period means, April 1994

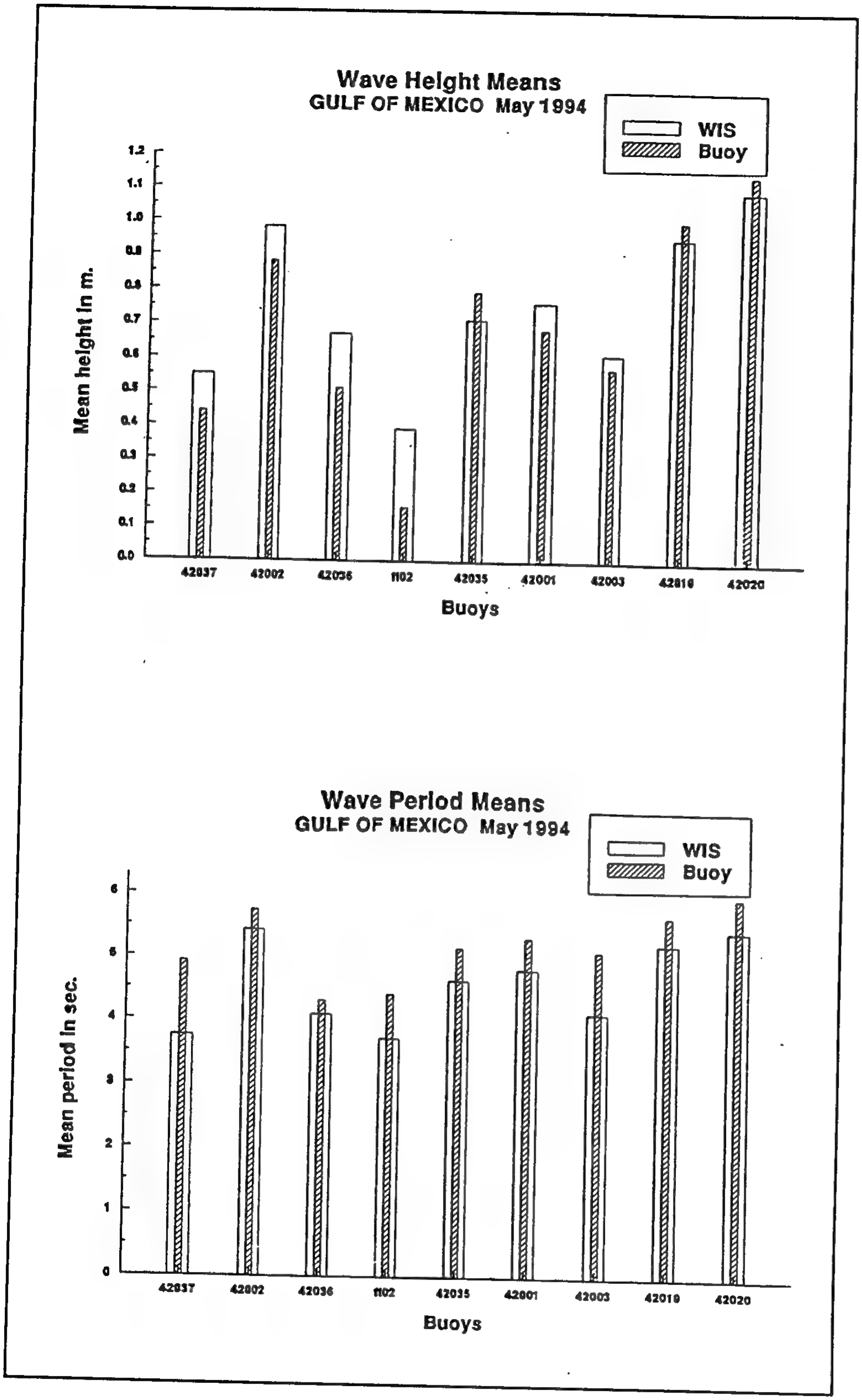

Figure 12. Wave height means and wave period means, May 1994

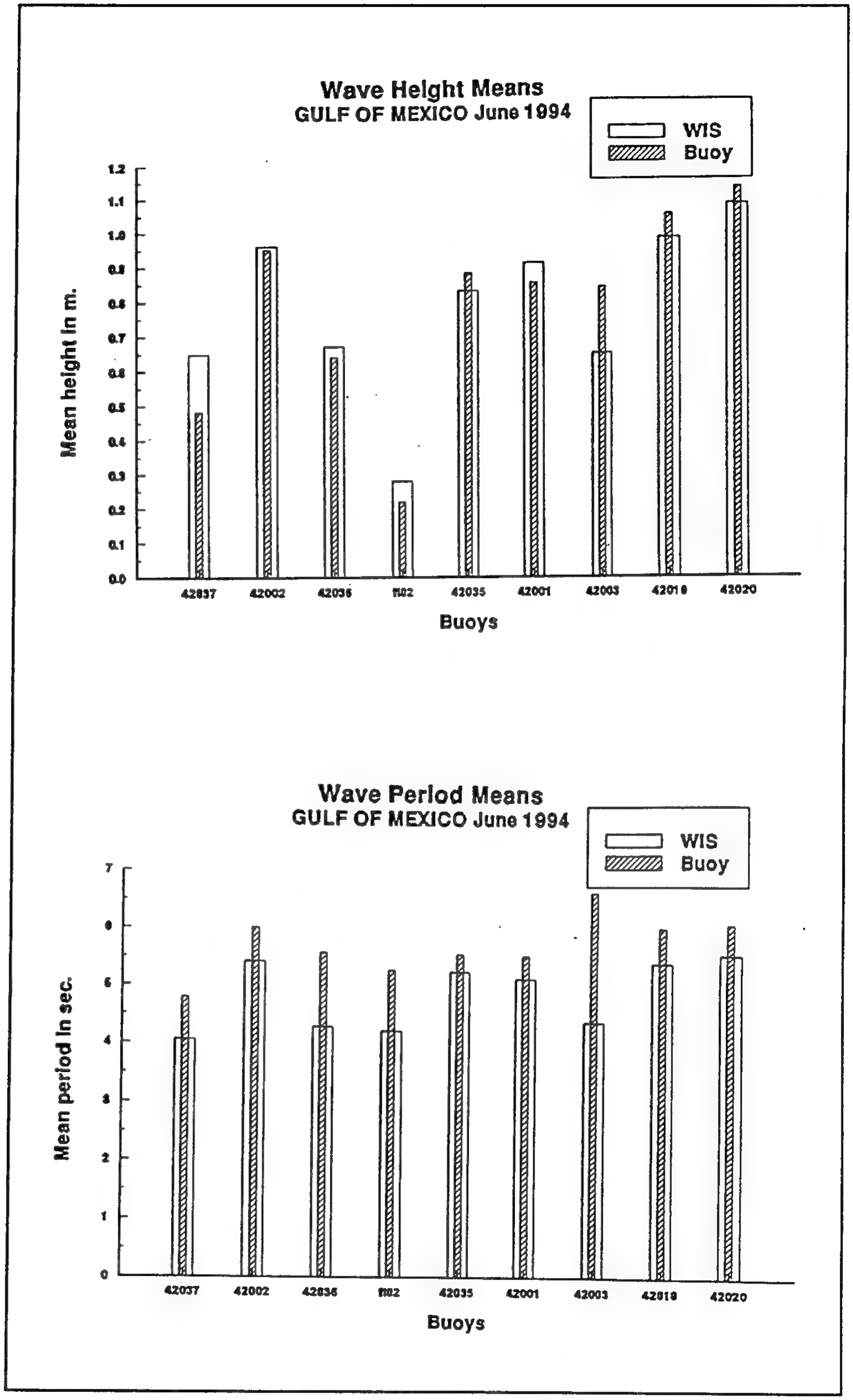

Figure 13. Wave height means and wave period means, June 1994

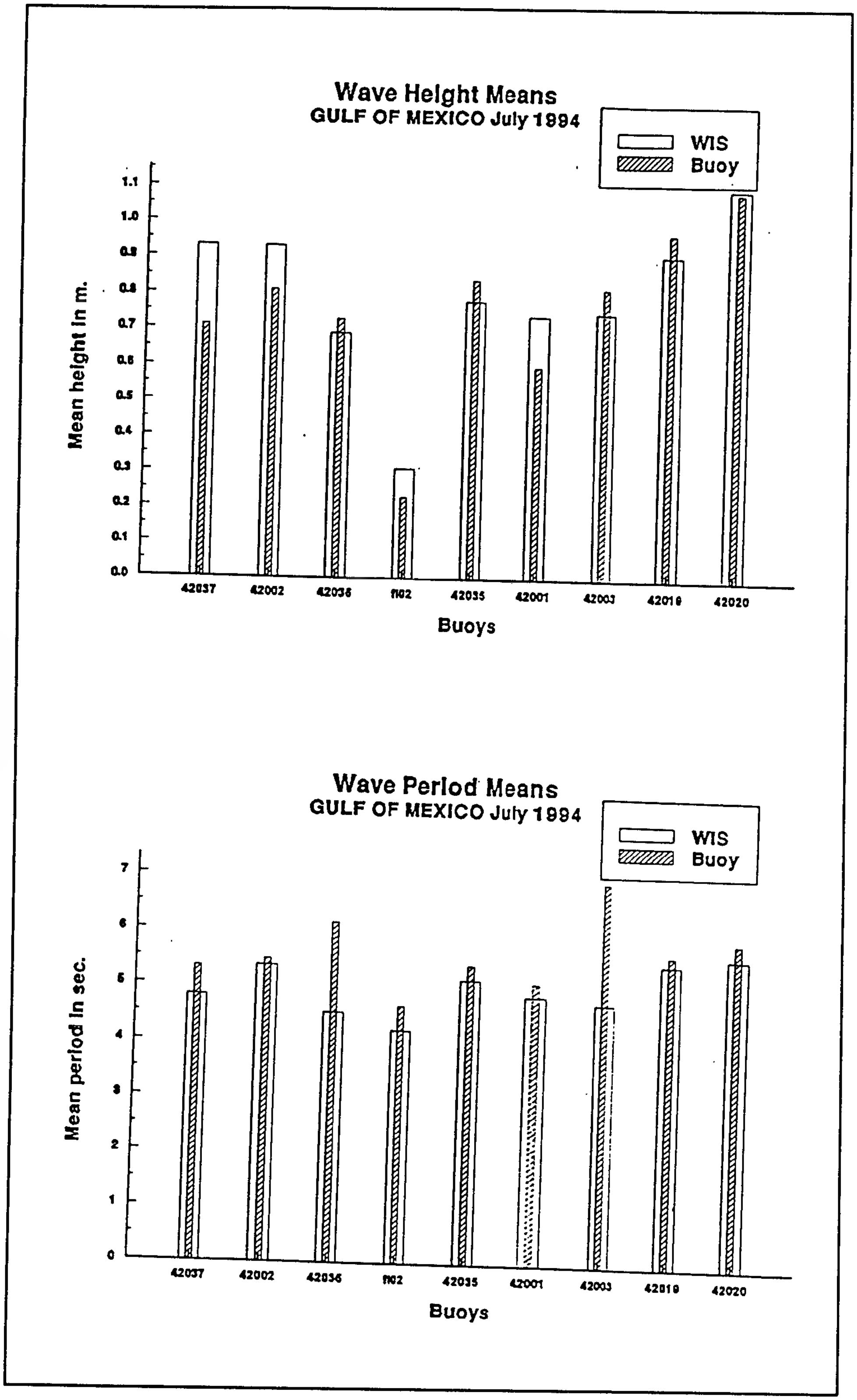

Figure 14. Wave height means and wave period means, July 1994

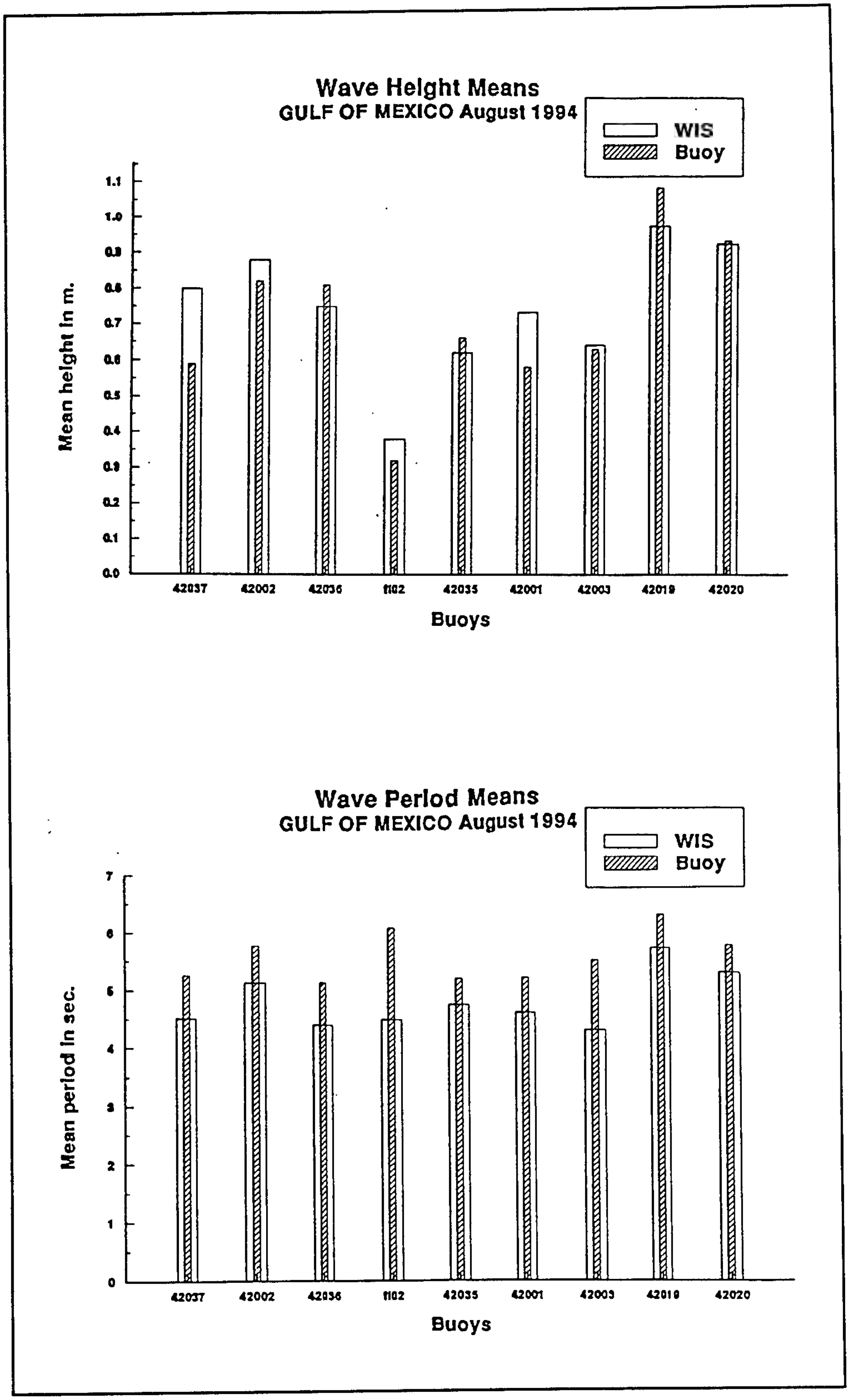

Figure 15. Wave height means and wave period means, August 1994

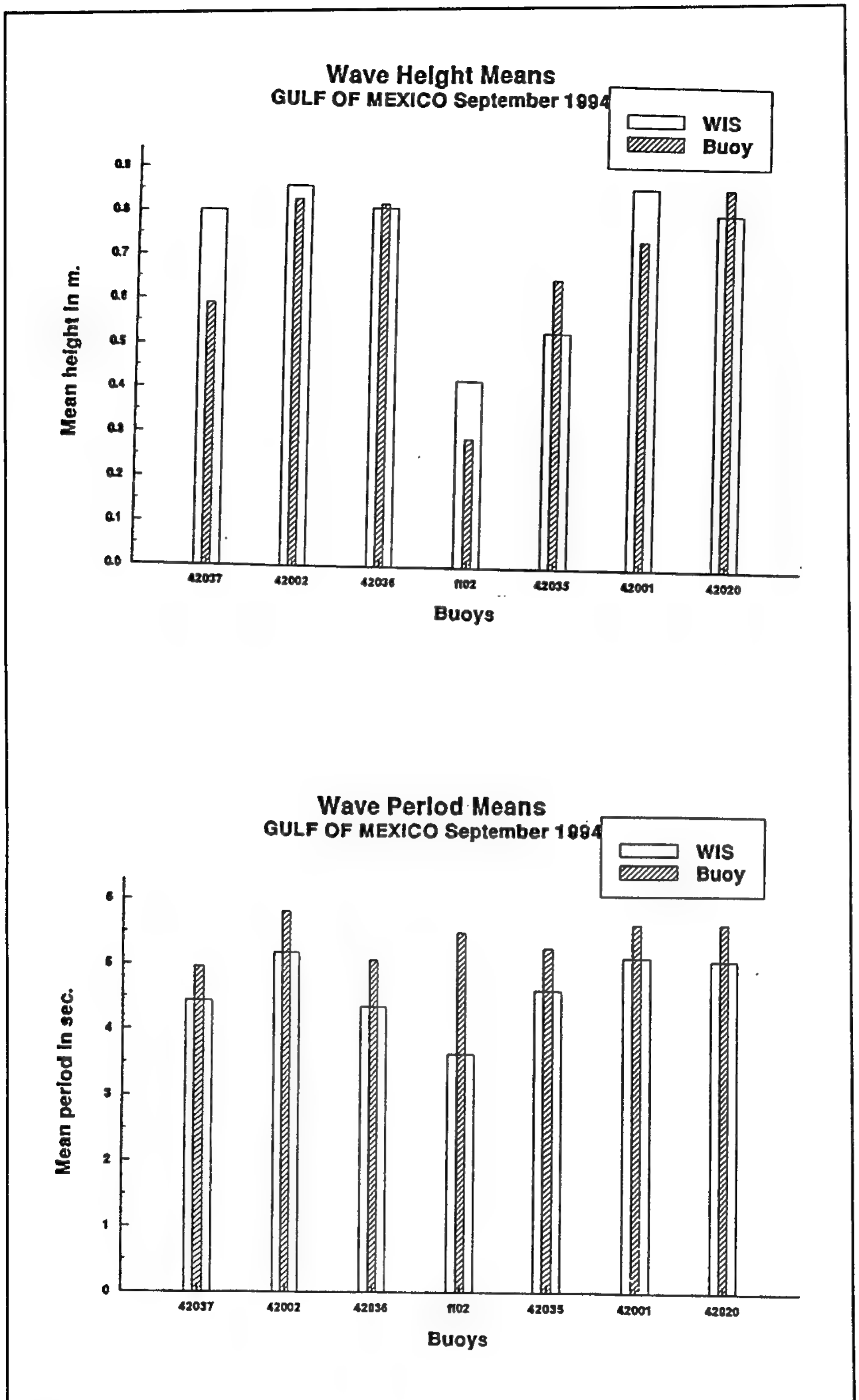

Figure 16. Wave height means and wave period means, September 1994

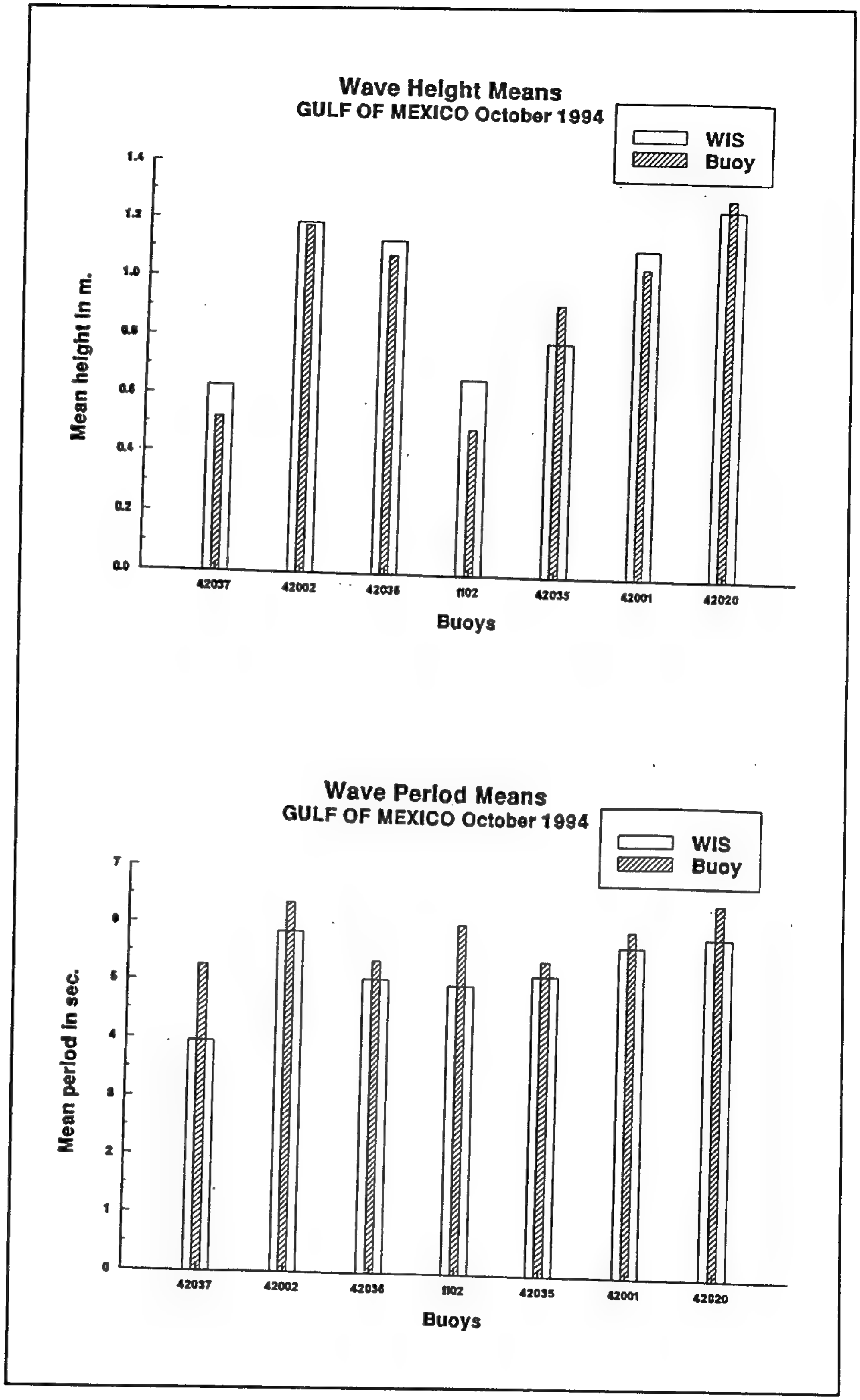

Figure 17. Wave height means and wave period means, October 1994

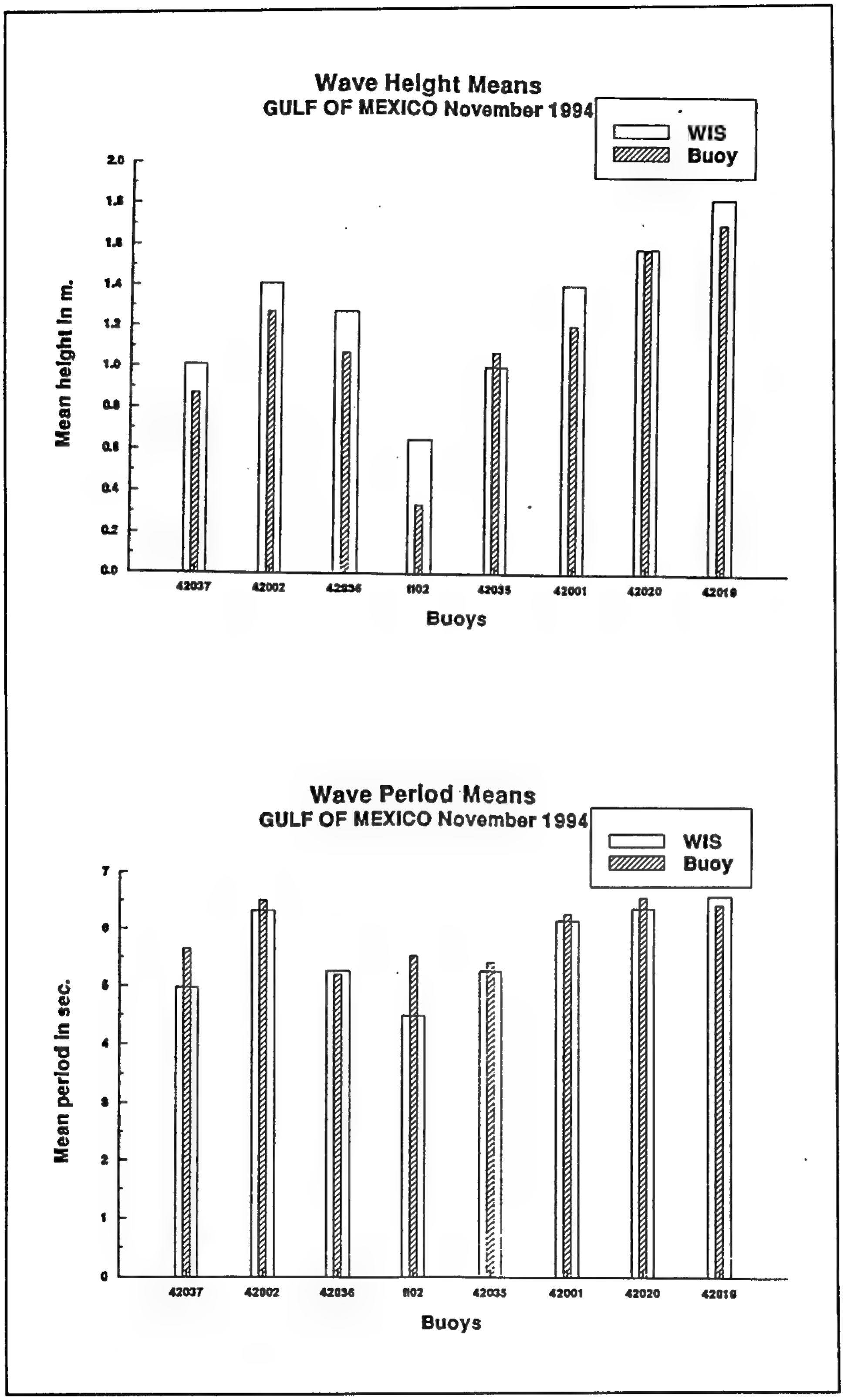

Figure 18. Wave height means and wave period means, November 1994

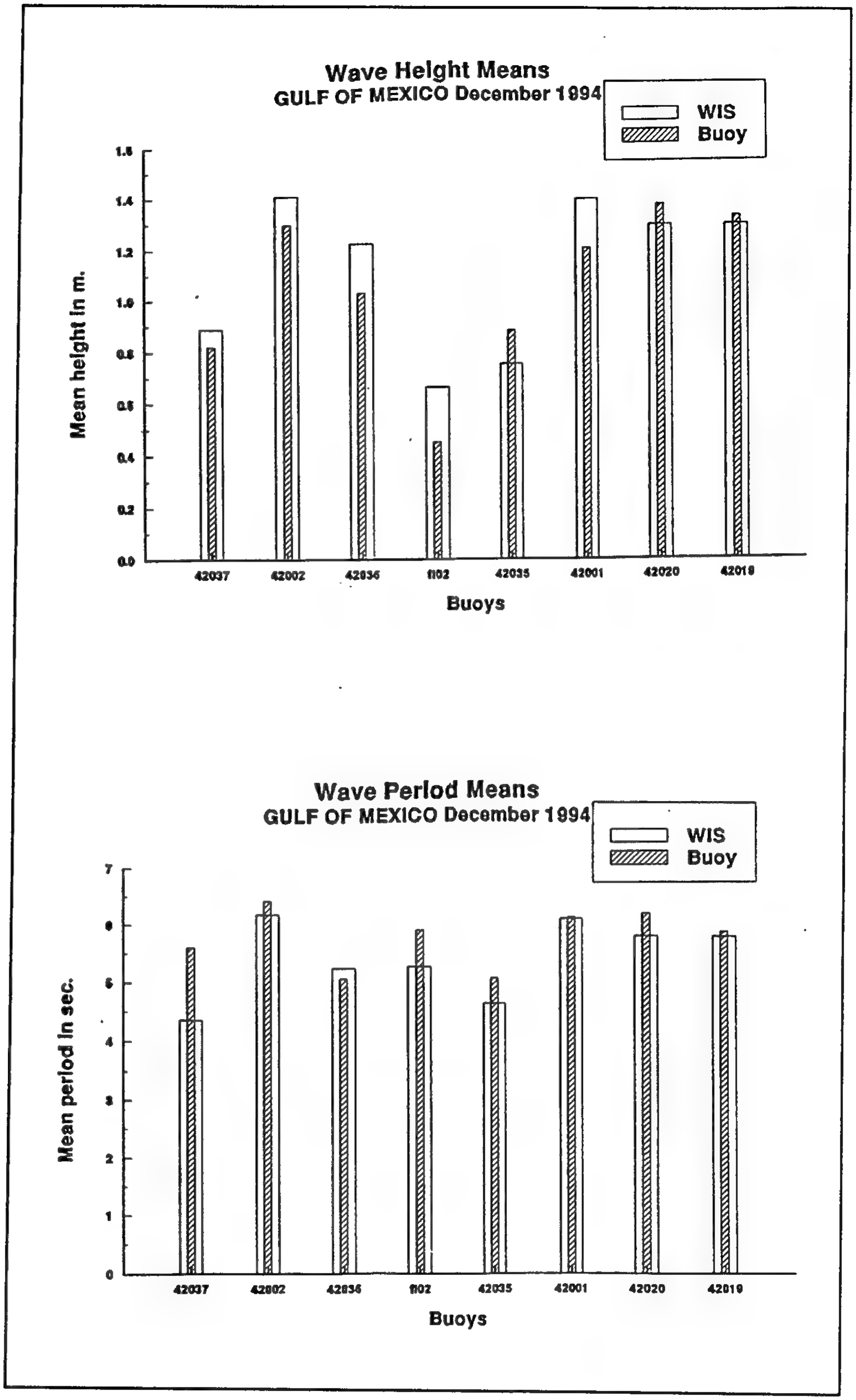

Figure 19. Wave height means and wave period means, December 1994

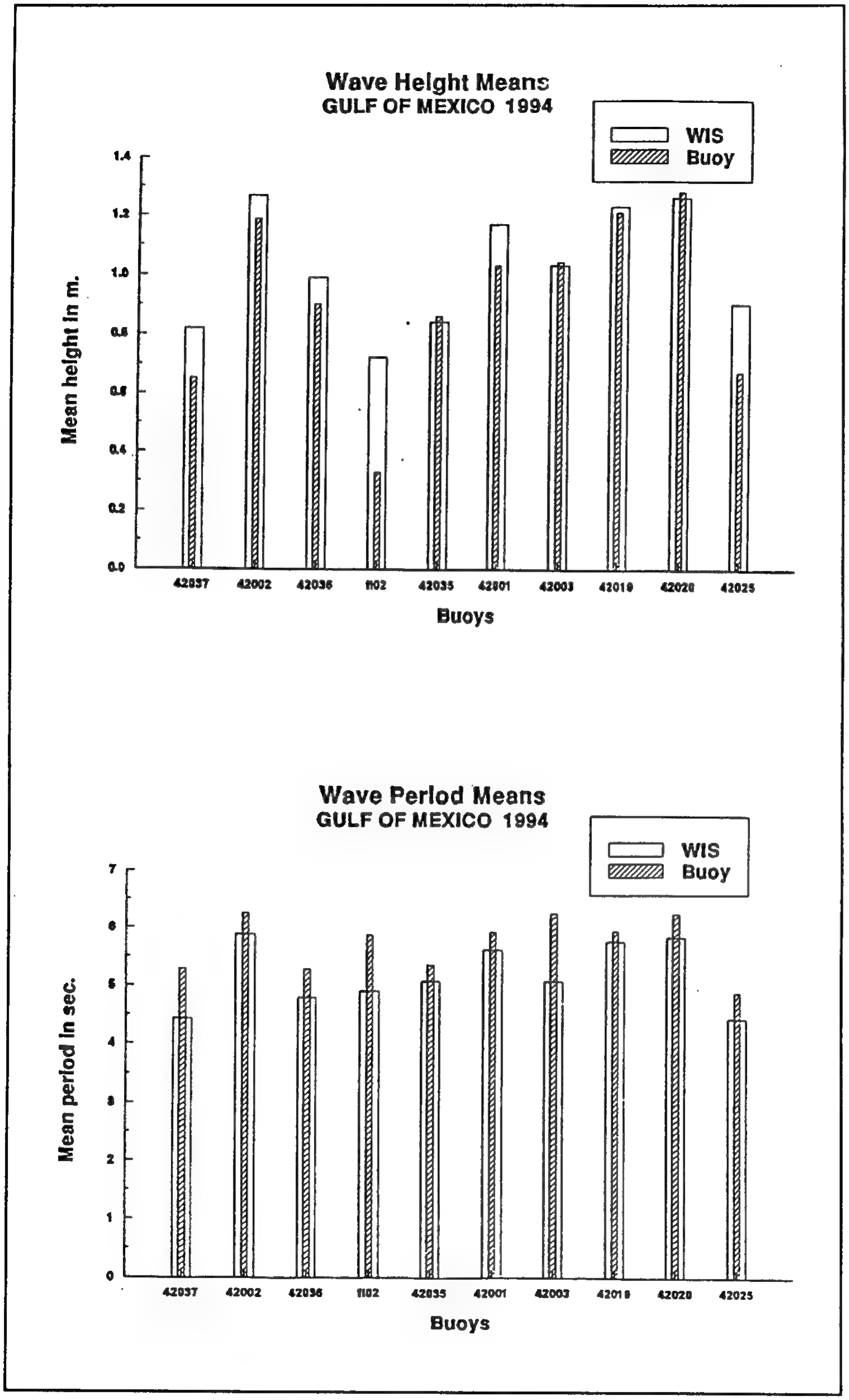

Figure 20. Wave height means and wave period means, 1994

Table 15
Gulf of Mexico 1994

		Hs (m)			Tp (sec)			Dp (deg)			Ws (m/s)			Wd (deg)		
Gauge	Station	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases	Bias	RMSD	Cases
42037	1	.2	.3	6340	-.9	1.6	6339	-1.2	48.7	6153	1.0	1.9	6522	8.0	43.9	6480
42002	96	.1	.3	8548	-.4	1.1	8546	-.8	34.3	2387	-.3	1.9	8546	2.3	38.3	8465
42036	101	.1	.4	8191	-.5	1.5	8190	-2.7	49.2	8010	.6	2.0	8292	16.5	51.6	8174
FL02	102	.4	.5	4370	-1.0	1.9	2366	28.0	90.3	2342	.0	.0	0	.0	.0	0
42035	77	.0	.3	8631	-.3	1.2	8589	.0	.0	0	-.9	2.3	8600	9.1	43.2	8474
42001	95	.1	.3	8621	-.3	1.1	8618	.0	.0	0	-.1	1.9	8603	2.9	40.8	8523
42003	97	.0	.4	5722	-1.2	2.0	5721	.0	.0	0	-.3	1.9	4420	2.1	41.4	4403
42019	98	.0	.3	5325	-.2	1.0	5325	.0	.0	0	.2	2.0	4787	5.1	42.1	4745
42020	99	.0	.3	8669	-.4	1.1	8669	.0	.0	0	.0	2.1	8665	-2.8	36.9	8544
42025	100	.2	.4	1773	-.4	1.4	1772	.0	.0	0	.0	.0	0	.0	.0	0

Bias = model - gauge
Direction from, compass
Values every 1 hour, 8,760 possible

4 Model Results

Hindcast results for 1994 were tabulated for every fifth station shown in Figure 2. The 1994 data for all stations shown in Figure 2 are available from the CEDRS database. Table 16 lists the 1994 mean wave heights for every fifth output station beginning with station 5. Monthly means and a yearly mean are shown. Table 17 lists the monthly and yearly peak mean periods for the same group of stations. Table 18 lists the 1994 maximum wave for each month and the maximum wave for the year for the selected Gulf of Mexico output stations. The associated period and direction of each maximum wave are also included. Periods are in seconds and directions are in meteorological convention.

WIS Report 18 (Hubertz and Brooks 1989) contains information on the means and maxima for the previous Gulf of Mexico hindcast (1956-1975). When comparing maximum and mean wave information between the two hindcasts, remember that the 1956-1975 hindcast did not contain any hurricanes and was run with a different numerical hindcast model. The previous wind fields were created from pressure fields, and the new hindcast was run using NMC winds.

Table 16
Mean Wave Height (m)

WIS Station	January	February	March	April	May	June	July	August	September	October	November	December	1994
5	1.4	1.0	.9	1.1	.6	.7	1.0	.8	.9	.7	1.3	1.1	1.0
10	1.0	.7	.7	.7	.4	.4	.6	.5	.5	.5	.8	.8	.6
15	.8	.5	.6	.4	.3	.3	.3	.3	.3	.4	.6	.5	.5
20	.8	.5	.7	.4	.4	.3	.3	.3	.4	.5	.6	.6	.5
25	.7	.5	.7	.3	.4	.4	.4	.4	.4	.5	.5	.5	.5
30	.6	.5	.6	.3	.4	.5	.4	.4	.3	.4	.4	.4	.4
35	1.0	.8	.9	.5	.5	.7	.7	.6	.6	.9	.9	.8	.7
40	.7	.6	.7	.4	.4	.7	.6	.4	.4	.6	.6	.5	.5
45	1.1	.8	.9	.6	.5	.8	.7	.5	.6	.9	.9	.7	.8
50	1.0	.8	.8	.7	.5	.7	.6	.5	.6	.8	.8	.7	.7
55	1.6	1.2	1.2	1.0	.6	.8	.8	.7	.8	1.1	1.3	1.1	1.0
60	1.2	.9	.9	.9	.6	.7	.7	.6	.7	.9	1.0	.8	.8
65	.8	.6	.7	.7	.5	.6	.6	.4	.4	.6	.7	.5	.6
70	.9	.7	.7	.8	.6	.7	.7	.4	.3	.6	.7	.5	.6
75	1.1	.9	.8	.9	.7	.8	.7	.5	.5	.8	.9	.7	.8
80	1.3	1.0	.9	1.1	.8	.9	.9	.7	.6	.9	1.1	.9	.9
85	1.2	1.0	.9	1.1	.8	.9	.9	.8	.6	.9	1.1	.8	.9
90	1.2	1.0	.9	1.1	.9	.9	.9	.8	.6	.9	1.0	.9	.9
95	2.0	1.5	1.4	1.2	.8	.9	.7	.7	.9	1.1	1.4	1.4	1.2
100	1.2	.9	.8	1.0	.5	.6	.8	.7	.7	.6	1.0	.8	.8

Table 17
Mean Wave Period (sec)

WIS Station	January	February	March	April	May	June	July	August	September	October	November	December	1994
5	5.6	5.1	4.9	5.3	4.0	4.3	5.1	4.8	4.7	4.4	5.6	5.1	4.9
10	4.7	4.3	4.5	3.9	3.4	3.6	3.6	3.5	3.6	4.0	4.5	4.6	4.0
15	4.5	4.0	4.3	3.7	3.5	3.5	3.8	3.5	3.5	4.0	3.9	4.3	3.9
20	4.4	3.9	4.4	3.4	3.4	3.8	3.7	3.6	3.4	3.9	3.7	4.0	3.8
25	4.7	4.0	4.6	3.4	3.6	3.9	4.2	3.9	3.4	3.9	3.6	3.8	3.9
30	4.7	4.2	4.6	3.5	3.4	4.1	4.0	4.0	3.6	4.2	3.5	3.5	3.9
35	5.0	4.5	4.7	3.9	3.7	4.3	4.3	4.1	4.0	4.6	4.4	4.1	4.3
40	4.8	4.6	5.0	4.3	3.8	4.5	4.5	4.3	3.9	4.5	4.0	3.6	4.3
45	5.2	4.9	4.9	4.2	3.8	4.5	4.5	4.2	4.1	4.7	4.5	4.2	4.5
50	5.1	4.8	4.9	4.3	4.0	4.4	4.3	4.2	4.3	4.7	4.4	4.3	4.5
55	6.2	5.6	5.4	5.0	4.4	4.8	4.8	4.5	4.8	5.3	5.7	5.2	5.2
60	5.3	5.0	5.1	4.8	4.1	4.8	4.7	4.4	4.5	4.9	4.7	4.6	4.7
65	5.4	5.0	5.0	5.1	4.4	5.0	4.8	4.5	4.2	4.8	4.7	4.1	4.8
70	5.4	5.4	5.1	5.4	4.5	5.2	4.8	4.6	4.6	5.0	5.1	4.3	4.9
75	5.8	5.4	5.5	5.7	4.7	5.4	5.0	4.8	4.6	5.0	5.1	4.5	5.1
80	6.1	5.7	5.9	5.8	5.1	5.4	5.4	5.0	4.9	5.3	5.6	5.1	5.4
85	6.4	5.7	6.0	6.2	5.4	5.6	5.6	5.1	5.0	5.5	5.8	5.4	5.6
90	6.8	6.1	5.6	6.0	5.2	5.3	5.4	5.1	5.0	5.8	6.1	5.9	5.7
95	7.0	6.4	6.0	5.6	4.8	5.1	4.8	4.6	5.1	5.6	6.2	6.1	5.6
100	5.0	4.4	4.2	4.6	3.6	3.8	4.4	4.1	4.1	3.8	4.5	4.2	4.2

Table 18
Maximum Wave Height (m) with Associated Period (sec) and Direction (deg)

WIS Station	January	February	March	April	May	June	July	August	September	October	November	December	1994
5	4.0	2.7	3.7	2.9	2.0	1.7	2.2	1.9	2.4	2.9	3.7	3.0	4.0
	8.	8.	9.	8.	7.	6.	7.	7.	8.	7.	8.	8.	8.
	94.	90.	288.	94.	90.	90.	97.	97.	108.	79.	248.	310.	94.
10	2.2	1.5	2.7	1.4	1.3	1.0	1.3	1.1	1.3	1.5	2.6	2.4	2.7
	8.	5.	9.	5.	5.	4.	5.	4.	5.	5.	9.	10.	9.
	281.	65.	288.	101.	29.	97.	108.	108.	61.	54.	245.	288.	288.
15	3.0	1.2	2.9	1.1	.9	.6	.6	.6	.8	1.5	2.5	2.4	3.0
	8.	4.	10.	5.	4.	4.	8.	3.	4.	6.	7.	8.	8.
	266.	342.	270.	317.	288.	187.	256.	104.	130.	234.	158.	288.	266.
20	3.7	1.3	3.2	1.0	1.2	.8	1.0	.9	1.0	2.3	1.8	2.6	3.7
	9.	7.	8.	5.	5.	5.	8.	4.	4.	8.	5.	9.	9.
	252.	270.	223.	317.	310.	202.	238.	126.	61.	230.	43.	266.	252.
25	3.1	1.6	3.0	.8	1.3	1.0	1.2	1.6	.9	2.5	1.4	2.4	3.1
	9.	7.	9.	5.	5.	5.	9.	7.	5.	9.	5.	8.	9.
	259.	259.	270.	306.	18.	263.	238.	230.	230.	245.	356.	288.	259.
30	2.4	1.8	2.6	.9	1.0	1.4	2.5	2.5	1.0	3.2	1.0	1.3	3.2
	7.	7.	9.	4.	5.	6.	9.	9.	5.	9.	5.	5.	9.
	234.	223.	212.	212.	241.	223.	209.	212.	223.	212.	281.	320.	212.

(Sheet 1 of 3)

Table 18 (Continued)

WIS Station	January	February	March	April	May	June	July	August	September	October	November	December	1994
35	2.6	2.0	2.8	1.2	1.4	1.7	4.4	2.8	1.7	4.4	1.7	2.0	4.4
	8.	8.	9.	5.	5.	6.	9.	9.	6.	9.	6.	7.	9.
	245.	184.	173.	133.	58.	198.	169.	191.	126.	191.	72.	292.	169.
40	2.4	2.2	2.1	1.0	.9	1.8	3.3	1.1	1.4	3.1	1.8	1.3	3.3
	8.	8.	8.	6.	4.	6.	10.	6.	7.	8.	7.	4.	10.
	169.	187.	176.	162.	220.	205.	173.	223.	176.	187.	187.	328.	173.
45	3.2	2.6	2.6	1.3	1.3	2.4	3.5	1.3	2.2	3.0	2.1	1.8	3.5
	9.	8.	8.	6.	5.	7.	9.	5.	7.	8.	7.	5.	9.
	155.	194.	173.	144.	47.	209.	133.	230.	119.	130.	169.	331.	133.
50	3.0	2.3	2.6	1.4	1.1	1.7	2.1	.9	1.7	2.7	2.1	1.4	3.0
	10.	6.	9.	6.	5.	5.	9.	5.	7.	8.	8.	5.	10.
	137.	187.	155.	133.	148.	212.	137.	126.	115.	119.	158.	317.	137.
55	4.3	3.1	3.6	2.2	1.7	2.2	3.1	1.3	2.6	3.2	3.0	2.5	4.3
	10.	7.	9.	7.	6.	7.	8.	5.	8.	9.	8.	7.	10.
	122.	54.	176.	47.	104.	212.	241.	108.	79.	108.	173.	47.	122.
60	3.0	2.0	3.1	1.7	1.5	1.5	2.3	1.1	2.1	2.3	2.5	1.7	3.1
	10.	6.	9.	7.	6.	6.	8.	5.	6.	9.	9.	5.	9.
	144.	209.	166.	140.	122.	191.	216.	97.	86.	130.	166.	320.	166.
65	2.5	1.4	2.5	1.3	1.0	1.3	1.7	.9	.8	1.3	2.5	1.5	2.5
	9.	7.	9.	7.	6.	6.	7.	7.	7.	8.	9.	7.	9.
	194.	194.	194.	191.	191.	220.	223.	194.	180.	187.	202.	212.	194.

(Sheet 2 of 3)

Table 18 (Concluded)

WIS Station	January	February	March	April	May	June	July	August	September	October	November	December	1994
70	2.5	1.6	2.5	1.8	1.3	1.6	1.3	1.1	.9	1.4	2.7	1.7	2.7
	8.	5.	10.	8.	6.	5.	5.	8.	7.	5.	7.	7.	7.
	184.	176.	169.	166.	173.	205.	205.	176.	166.	133.	180.	205.	180.
75	2.6	1.8	2.4	2.2	1.4	1.6	1.4	1.3	1.1	1.8	2.7	1.7	2.7
	9.	7.	10.	8.	6.	6.	5.	8.	7.	7.	9.	7.	9.
	184.	176.	169.	162.	158.	194.	187.	169.	166.	140.	180.	169.	180.
80	2.9	1.9	2.3	2.5	1.6	1.6	1.4	1.5	1.4	2.1	3.1	1.8	3.1
	9.	7.	9.	8.	7.	6.	5.	8.	7.	7.	8.	7.	8.
	180.	173.	162.	151.	151.	137.	173.	155.	151.	133.	180.	151.	180.
85	2.6	1.9	2.0	2.5	1.7	1.7	1.7	1.7	1.5	2.2	2.5	2.2	2.6
	9.	7.	9.	9.	6.	7.	6.	8.	7.	8.	9.	9.	9.
	162.	162.	144.	140.	144.	144.	155.	144.	140.	140.	158.	155.	162.
90	2.4	1.8	1.8	1.9	1.6	1.6	1.7	1.5	1.7	1.7	2.1	1.9	2.4
	8.	5.	5.	9.	5.	7.	6.	8.	9.	9.	7.	8.	8.
	83.	173.	353.	108.	148.	119.	140.	122.	94.	90.	65.	112.	83.
95	3.8	3.0	4.6	2.5	1.8	1.9	2.1	1.6	4.0	2.9	3.1	3.6	4.6
	9.	9.	9.	8.	7.	6.	9.	6.	9.	9.	7.	9.	9.
	133.	36.	158.	22.	43.	180.	112.	140.	79.	83.	32.	349.	158.
100	2.8	2.3	2.6	2.3	1.7	1.4	1.9	1.6	2.0	2.1	3.8	3.2	3.8
	7.	6.	7.	6.	6.	6.	6.	6.	6.	6.	8.	8.	8.
	43.	54.	119.	97.	144.	115.	119.	112.	112.	58.	212.	184.	212.

(Sheet 3 of 3)

5 Data Availability

WIS hindcast data are available on the Internet by anonymous ftp (file transfer protocol). Information about obtaining this data may be viewed at World Wide Web site http://www.wes.army.mil by selecting the Coastal Engineering Research Center. If a Web browser is not available, the following instructions will be of assistance:

ftp Bigfoot.cerc.army.wes.mil

id: anonymous

password: your email address

cd /pub/gul

The file entitled README.NOW will give instructions about downloading data. For help or additional information, please contact webmaster@cerc.wes.army.mil by email.

This report is the first in a yearly series of nowcast reports. WIS is attempting to make current wave information available for coastal projects. The NMC wind fields provide an accurate representation of the 1994 wind climate. Monthly comparisons with measurements provide quality control on the numerical wave output data. The ability to redefine the hurricane winds with the HURWIN process gives more realistic hurricane wave results. New procedures to redefine other nontropical storms will be added to the procedure as they become available.

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Under the Wave Information Studies authorized by Headquarters, U.S. Army Corps of Engineers, a "nowcast" system has been instituted to make U.S. coastal wave information available to users. The WIS nowcast adds yearly updates to the original database and meets the needs of coastal engineers who need recent wave information. The nowcast wave hindcasts use monthly wind information from the National Meteorological Center to drive the WIS wave hindcast model. Measured wave buoy data, available several months after being recorded, are used to verify the numerical hindcasts. When the completed hindcast has been verified with measured data, the nowcast information is transferred to the Coastal Engineering Data Retrieval System (CEDRS) on the World Wide Web computer network.

This report, the first in a series of annual GOM nowcast reports, discusses the WIS 1994 Gulf of Mexico (GOM) wave hindcast for U.S. nearshore coastal stations in the gulf.

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